



Polaroid

Repair Manual



ProPalette 8000

June 1997

***Americas Business Center
Technical Services
201 Burlington Road
Bedford MA 01730
TEL: 1.781.386.5309
FAX: 1.781.386.5988***

POLAROID REPAIR MANUAL

PROPALETTE 8000 COLOR FILM RECORDER

Contents

Purpose of This Manual	6
Manual Organization.....	6
Other Service Documents.....	6
Important Safety Instructions	7
Electrostatic Discharge Warning	7
Note, Caution and Warning Conventions.....	7
1. ProPalette 8000 Description	8
General Description	8
ProPalette Features	9
Interface Kits	12
Specifications.....	13
2. Hardware Operating Information	15
Quick Start Guide	15
ProPalette Package Components	16
Controls, Indicators and Connectors	17
Connecting to a PC Parallel Port	19
Connecting to a SCSI Interface	20
SCSI Connection Diagrams.....	23
Testing the Installation	24
Using the 35mm Camera Back	25
Protecting the CRT and Camera from Dust	30
Cleaning the CRT Face	30
Cleaning the Camera Lens.....	31
Testing the Hardware Installation.....	31
Troubleshooting Hardware and Film Problems	32
LCD Panel Messages	34
Setup Menu Reference	35

3. Theory of Operation.....	36
Overview	36
ProPalette Major Systems	38
Exposure System	40
Digital Board	43
Analog Board	50
Slowsan Description and Imaging Sequence	51
Flash Description	57
Autoluma Description	59
Firmware Description.....	60
Camera Back Interface.....	60
Keypad/LCD Interface	62
Pacing Commands.....	64
4. Troubleshooting and Diagnostics.....	66
Recommended Diagnostic Sequence	66
Inspection and Cleaning	66
Firmware Upgrade	66
ProPalette Startup Diagnostics and Tests	68
Test Image Exposure Sequence.....	71
Monitor Mode	71
Error Message Redisplay.....	71
Serial Communication Cable	71
Digital Board Diagnostics (FPDIAG) via Host Computer.....	72
Configuring a PC to Upload a Hex File	74
Digital Board Interface Test.....	78
Analog Board Voltage Test.....	79
Analog Board Functional Test via Host Computer	81
Analog Board Functional Test Troubleshooting	83
Parallel Port Hardware Test	83
SCSI Interface Hardware Test	83
Image Evaluation	83
Error Message and Symptom Tables	87
5. Test Stand Operation	108
Test Stand Description.....	108
Test Stand Functions.....	109
Test Stand Calibration.....	109
Connecting ProPalette and Powering Up the Test Stand.....	110
Upgrading ProPalette Firmware	113
Testing the Digital Board	114
Checking Yoke Position.....	117
Assembly After Yoke Adjustment	124

5. Test Stand Operation (Continued)	
Testing the Analog Board	127
Aligning the ProPalette	131
Focusing the 35mm Camera	134
6. Parts Replacement.....	139
Removal of the Front Bezel Assembly	140
Installation of the Front Bezel Assembly.....	140
Removal of the LCD Keypad Assembly.....	141
Installation of the LCD Keypad Assembly	141
Removal of the LCD Panel.....	142
Installation of the LCD Panel	142
Removal of the Front Bezel Door.....	143
Installation of the Front Bezel Door	143
Removal of the Power Switch	144
Installation of the Power Switch.....	144
Removal of the Camera Plate Assembly.....	145
Installation of the Camera Plate Assembly	146
Removal of the Camera Cable (Teka) Connector.....	146
Installation of the Camera Cable (Teka) Connector	147
Removal of the Top Cover and Rear Panel Assembly	148
Installation of the Top Cover and Rear Panel Assembly.....	149
Removal of the Stepper Motor	150
Installation of the Stepper Motor.....	151
Removal of the Autoluma Board Assembly	152
Installation of the Autoluma Board Assembly	153
Removal of the Wheel Position Sensor (Photo Interrupter).....	153
Installation of the Wheel Position Sensor (Photo Interrupter)	155
Removal/Installation Of The LCD Interface Cable.....	156
Removal/Installation of the Camera Cable Assembly	156
Removal of the Electronics Drawer	158
Installation of the Electronics Drawer.....	159
Removal of the Digital PC Board Assembly	160
Installation of the Digital PC Board Assembly	160
Replacement of the Camera Power Fuse.....	160
Removal of the Analog PC Board	161
Installation of the Analog PC Board	161
Removal of the Low Voltage Power Supply.....	162
Installation of the Low Voltage Power Supply	162
Removal of the Light Box Assembly	163
Installation of the Light Box Assembly	165
Disassembly of the CRT	168

6. Parts Replacement (Continued)	
Reassembly of the CRT.....	169
Removal of the Front Plate Assembly	169
Installation of the Front Plate Assembly.....	170
Removal of the Filter Wheel.....	171
Installation of the Filter Wheel	171
Replacement of the Filters	172
Removal of the High Voltage Power Supply	174
Installation of the High Voltage Power Supply	174
7. Schematics	175
Appendix A. Film Table List.....	195
Appendix B. Abbreviations in This Manual	197

Purpose of This Manual

This manual is intended to be a reference and training guide for authorized service technicians who install, troubleshoot and repair the Polaroid ProPalette 8000 Color Film Printer.

Manual Organization

This manual is organized into six sections:

- 1. ProPalette 8000 Description** Describes the ProPalette 8000 Color Film Printer, along with its features, components and specifications.
- 2. Hardware Operating Information** Setup, operating and troubleshooting instructions provided to users in *ProPalette 8000 Hardware Manual* (reproduced in this manual for the convenience of service technicians).
- 3. Theory of Operation** Detailed explanations of ProPalette system and component functions for use in diagnosing problems and performing other service.
- 4. Troubleshooting and Diagnostics** Instructions for diagnosing image defects, errors and other malfunctions, along with likely causes and suggested corrective action.
- 5. System Test Stand** Instructions for calibrating and adjusting ProPalette for optimum performance.
- 6. Parts Replacement** Instructions for replacing individual ProPalette components.
- 7. Schematics** Selected ProPalette schematic drawings for use in troubleshooting.

Other Service Documents

In addition to this manual, ProPalette 8000 service personnel should have access to the following documents:

ProPalette 8000 Parts Catalog
ProPalette 8000 Hardware Manual
Palette Export Software User Guide

Important Safety Instructions

When servicing the ProPalette 8000, always take the following safety precautions:

- Read and understand all applicable service procedures before proceeding.
- Turn off and unplug the unit before servicing.
- When service procedures require the unit to be plugged in with the cover off, take special care to avoid contact with high voltage connections, wires and components.

Warning

The ProPalette 8000 Color Film Printer has hazardous internal voltages. Maintenance operations, especially those performed with the printer cover removed, should be performed only by qualified service personnel.

Electrostatic Discharge Warning

ProPalette circuitry can be easily damaged by small, unnoticeable static discharges. **Always use an anti-static mat and wrist strap** when removing the ProPalette cover or when servicing the unit with the cover removed.

Note, Caution and Warning Conventions

The use of notes, cautions and warnings in this manual follows these conventions:

Note Information that is essential to highlight.

Caution Procedure or other information that, if not strictly observed, could result in equipment damage.

Warning Procedure or other information that, if not strictly observed, could result in personal injury or loss of life.

1. ProPalette 8000 Description

General Description

The Polaroid ProPalette 8000 (Figure 1-1) is a digital, photographic-quality printer designed for the mid-range color film recorder market. With a 7-inch CRT and custom optics to reduce spot size, ProPalette 8000 produces higher resolution images (8192 x 5462 maximum) than other film recorders in its product category.

The ProPalette 8000 prints on positive and negative 35mm films. Custom film tables also allow printing on E6, C41 and Polaroid instant films. In addition, optional cameras and custom film tables are available for 6x7 (120/220), 4x5 and 35mm bulk roll films. See Appendix A (page 195) for a complete list of ProPalette film tables.

Compared with other Polaroid Palette film recorder models, the ProPalette 8000 offers higher resolution, improved geometry, reduced vignetting (brightness falloff in corners) and easier manufacturing. ProPalette is also designed for faster printing: exposing a 4-kilobyte 35mm image requires less than 60 seconds.

ProPalette optics include dichroic filters to maximize transmittance and improve color cutoff. Also, a custom six-element 43.53mm/F6.6 glass lens and high-resolution 7-inch CRT with a proprietary anti-reflection and anti-static coating minimize spot size and maximize sharpness and color saturation.

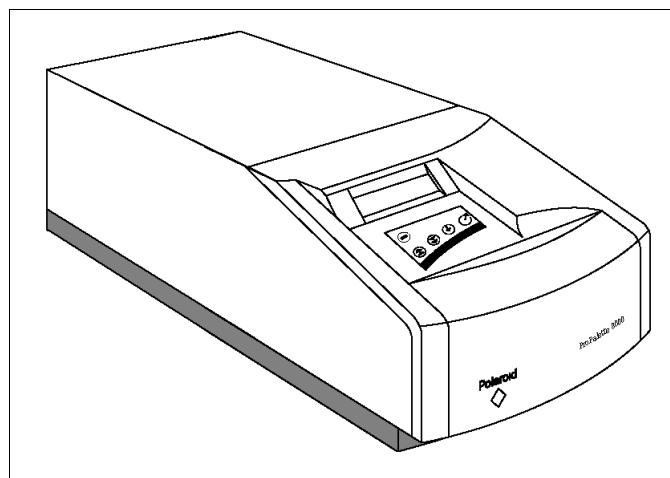


Figure 1-1. ProPalette 8000 film recorder

Brightness and color balance are automatically calculated before exposure of each image. Automatic digital geometry correction is provided for circles and lines to eliminate pincushion, barrel and keystone. The system's electronics adjust the focus of each image on the CRT and use custom lookup tables for horizontal and vertical planes.

ProPalette 8000 is simple to set up and use with either Macintosh or PC workstations. Its 35mm camera automatically loads film and counts exposures, and it automatically detects and sets up for different film types through DX encoding.

The 20-character LCD panel guides the user through setup and provides system status information. This information includes:

- Film type
- Frames remaining
- Output resolution
- Exposure time
- SCSI ID setting
- Firmware version number
- Error messages and codes

ProPalette can be accessed from Macintosh and PC computers via Adobe Photoshop and other Photoshop plug-in compatible applications with the Polaroid Palette Export plug-in module. This module is included in both Macintosh and PC interface kits.

ProPalette Features

<i>Feature</i>	<i>Description</i>	<i>Benefit</i>
Custom optics	Custom 6 element 43.53mm/F6.6 glass lens; dichroic filters which combine high transmittance with sharp color cut-off; custom CRT face plate optics	Minimize spot size and maximize color saturation
Automatic exposure and color balance control	Electronics for automatically setting optimum brightness and color balance before exposure of each image	Bright images and accurate colors

ProPalette Description

ProPalette 8000 Repair

<i>Feature</i>	<i>Description</i>	<i>Benefit</i>
Geometry correction	Automatic digital correction of geometry and linearity to eliminate pincushion, barrel and keystone	Distortion-free images
Dynamic focus adjustment	Automatic electronic focus of the image on the internal CRT using a lookup table customized for the individual unit	Consistent clarity and sharpness
High-resolution, 7-in. CRT	Large, precision CRT with proprietary anti-reflection and anti-static coating	Consistent clarity and sharpness
8K resolution	Variable resolution up to 8192 horizontal and 5462 vertical pixels	Clearly defined details and text
36-bit color depth	24-bit images with precision of 36 bits per pixel	Printing in 16.8 million colors, from a palette of 68 billion colors
Automated 35mm camera	Fast, automated film loading and exposure counting, with film-type recognition through DX film encoding; automatic film rewind	Simple, efficient operation and high productivity
LCD display on front panel	20-character x two-line interactive display provides setup and status information	Easy to learn operation and immediate understanding of current status for efficiency and productivity
Flash memory	4-megabyte DRAM, 512-kilobyte flash memory	Fast, simple upgrading as enhancements become available
Multiple film formats	Software and hardware support for 35mm, 4x5, 6x7 and 35mm bulk camera backs; custom film tables provided for E6, C-41 and Polaroid instant films	Flexibility to handle expanding or changing imaging needs

<i>Feature</i>	<i>Description</i>	<i>Benefit</i>
Self diagnostics	Unit performs a self-diagnostics routine at startup. Routine can also be initiated via the keypad or host computer, if necessary	Helps isolate problems quickly and without special tools or software
No potentiometer adjustments	Manual optimization unnecessary	Fast, automated, accurate calibration of individual units
Operating and service history stored in memory	Total exposures, film type used for each, service history information recorded in nonvolatile memory for reference	Up-to-date operating and service history always available to service technicians

Ports

ProPalette 8000 has four ports (Figure 1-2):

- Centronics parallel
- Synchronization IEEE 1284 style (supporting firmware not available on early units)
- SCSI-1
- RJ-11 serial (available to service personnel only)

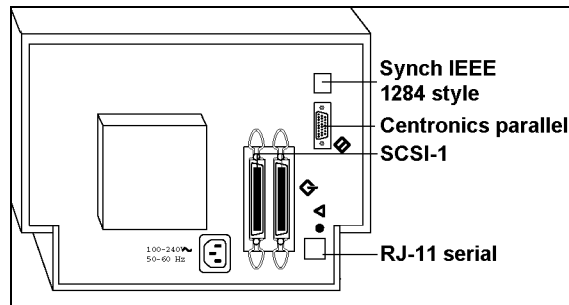


Figure 1-2. ProPalette ports

Interface Kits

The ProPalette software/interface components are summarized in Table 1-1.

<i>Table 1-1. ProPalette Software/Interface Matrix</i>					
<i>Name</i>	<i>Ver. No.</i>	<i>Vendor</i>	<i>Operating System</i>	<i>Description or Comments</i>	<i>PID No.</i>
Palette for Windows	1.0.4	Polaroid	Windows	Film table installer	
SuperPrint	3.1.3	Zenographics	Windows	Sold directly by vendor	
Polaroid Palette Export	1.1.0	Polaroid	Windows	Photoshop plug in	620238
Networking Multi-User Pack		Graphx	Windows	5-user license	619117
RasterPlus 95/ProPalette		Graphx	Windows 95	Postscript RIP	621667
RasterPlus 95/Digital Palette		Graphx	Windows 95	Postscript RIP	621668
RasterPlus 95/Upgrade for all		Graphx	Windows 95	Postscript RIP	621665
Polaroid Palette Export	1.1.0	Polaroid	Macintosh	Photoshop plug in	620237
Networking Multi-User Pack		GCC	Macintosh	5-user license	619785
VBS Professional Output Manager		VBS	Macintosh	Postscript RIP	
Si Print Assistant		Nutting	Macintosh	NPKK driver	
ImagePrint	1.42	Polaroid	DOS	CI&HR for CGM, TGA	618336
Palette for Macintosh	2.15	GCC	Macintosh		618337
RasterPlus P/S for Digital Palette			DOS		618335
Rasterizer		Pisa Systems	Mac/Windows	Hardware RIP	
ImageBox FX		Prime Option	Mac/Windows	Hardware RIP	

This table is subject to change without notice.

Windows Kit

The ProPalette Windows kit consists of the following:

Palette for Windows. Setup program for installing all necessary software. Includes film tables for E6, C-41 and instant films. (Required for any software installation.)

Zenographics SuperPrint. Includes Windows printing utility, networking utility, background-printing utility, drivers for ProPalette 8000 and other Polaroid color film recorders, drivers for major black and white printers.

Polaroid Palette Export. Plug-in module compatible with Adobe Photoshop and other popular image processing applications

Parallel cable. Allows ProPalette to be connected to the PC via a parallel port.

Unlike earlier Polaroid film printers, **DOS is not a supported environment.**

Macintosh Kit

The ProPalette Macintosh kit consists of the following:

Palette for Macintosh. Chooser-level driver for direct imaging from Macintosh applications, networking utility and background printing utility.

Polaroid Palette Export. Plug-in module compatible with Adobe Photoshop and other popular image processing applications.

SCSI cable and terminator. Allows ProPalette to be connected to a Macintosh or added to an existing SCSI chain.

Optional Components

Polaroid offers the following optional software and hardware for use with the ProPalette 8000:

- Zenographic's Networking Multi-User Pack
- Palette for Macintosh Networking Multi-User Pack
- VBS (Macintosh) software rasterizer
- Graphx (PC) software rasterizer
- Pisa Systems hardware rasterizer for Windows 95, Macintosh or Unix

Specifications

CRT	High Resolution 7" CRT
Optics	Dichroic filters Custom 43.53mm/F6.6/, 6-element glass lens Custom CRT face plate optics
Image precision	Automatic exposure and color balance control Geometry correction Dynamic focus circuitry
Image quality	Any resolution up to a maximum resolution of 8192 horizontal x 5462 vertical lines
Color depth	36 bits per pixel 16.8 million colors per image out of a 68 billion palette
Camera	Automated 35mm camera back

Controls	20 character by 2 line interactive LCD front panel display
Memory	4 MB DRAM, 512 KB flash
Hardware requirements	<p>PC environment:</p> <ul style="list-style-type: none">• 386SX or faster processor• Windows 3.1 or higher <p>Macintosh environment:</p> <ul style="list-style-type: none">• Apple Macintosh 11 or higher including Quadra, Centris, Powerbook, Power Mac• System 6.07 or later <p>Unix environment: Supported through third party manufacturer</p>
Hardware interface	Parallel and SCSI
Postscript compatibility	Software and hardware support through third party manufacturers
Network printing	Supported via software drivers
Optional cameras	6 x 7 (120/220) back, 6 x 8 (120/220) back, 4 x 5 back, bulk load 35mm back available through third party manufacturer
Power source	90-240 Vac, 50-60 Hz
Power consumption	Under 45 watts
Environment	<p>Temperature: 65 to 100 degrees Fahrenheit</p> <p>Storage Temperature: -20 to 160 degrees Fahrenheit</p> <p>Relative Humidity: 5 to 90 % non-condensing</p>
Dimensions	11" x 28" x 8.5", 28 x 71 x 21.6 cm
Weight	34 lb., 15.4 kg
Certifications	UL, FCC, TUV, C-UL, CE and EN55022
Warranty	<p>One year parts and labor</p> <p>Extended warranty available</p>

2. Hardware Operating Information

For the convenience of repair technicians, information in this chapter is reproduced from the *ProPalette 8000 Hardware Manual* provided to ProPalette purchasers.

Quick Start Guide

1. Turn off the computer and all equipment connected to it.
2. Use the cable provided to connect the ProPalette recorder to the computer.
3. Plug the power cord into the recorder, then into a power outlet.
4. If you are using the SCSI interface, be sure the SCSI connections are correct and properly terminated.

Note

For termination, use the recorder's internal termination (see "Changing Termination" on page 21) or an external terminator.

5. Turn on the ProPalette, then the computer.
6. Load film into the camera/adaptor.
7. Install the software according to instructions packaged with it.

ProPalette Package Components

The ProPalette 8000 package contains the following components:

- Recorder (**a** in Figure 2-1)
- Power cord (**b** in Figure 2-1)
- 35mm camera back (**c** in Figure 2-1); comes mounted on recorder
- Hardware manual and registration card (not shown)

In addition to the package components, ProPalette comes with one of the software kits described below.

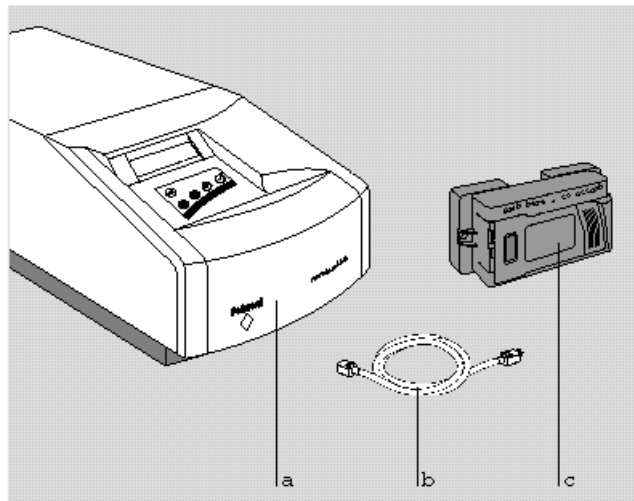


Figure 2-1. ProPalette 8000 components

Palette for Macintosh Software Kit

The Palette for Macintosh software kit consists of the following:

- Macintosh SCSI cable (25-pin to 50-pin)
- SCSI terminator
- Polaroid software
- Polaroid Palette for Macintosh manual
- Polaroid Palette Export for Macintosh (Adobe Photoshop plug-in) software and instructions

Digital Palette for Windows/ProPalette for Windows Software Kit

The Digital Palette for Windows/ProPalette for Windows software kit consists of the following:

- Host interface parallel cable
- Polaroid ProPalette for Windows installation disk
- SuperPrint software for windows disk
- SuperPrint user's manual
- Polaroid Palette Export for Windows

Controls, Indicators and Connectors

Front (Without Camera)

The following controls, indicators and connectors on the front of the ProPalette unit are shown in Figure 2-2:

- a. Message panel (see page 34 for messages)
- b. Keypad
- c. Camera connector
- d. Attachment holes for optional camera backs
- e. Camera locking lever
- f. 35mm Camera positioning holes
- g. Power OFF/ON (0/1) switch (beneath door)
- h. Lens cap holder and lens cap
- i. Front cover

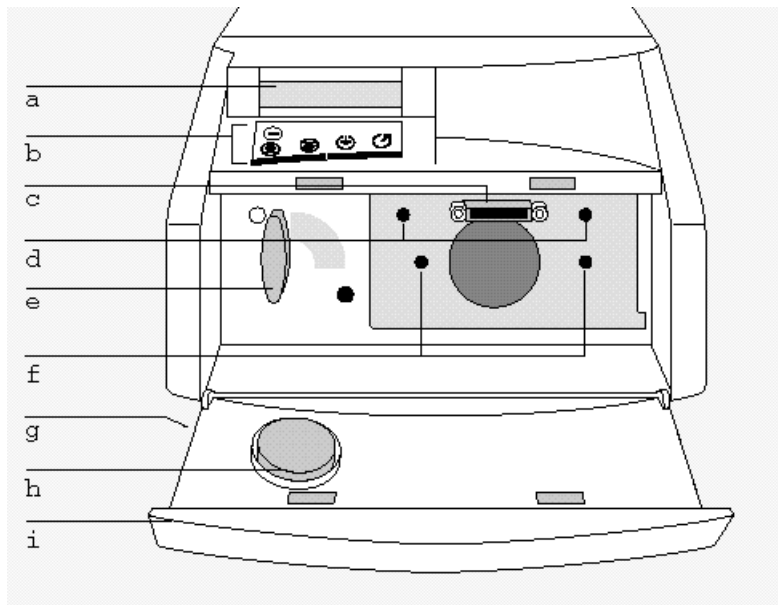


Figure 2-2. Front controls, indicators, features

Keypad

The ProPalette keypad controls and indicators are identified in Figure 2-3.

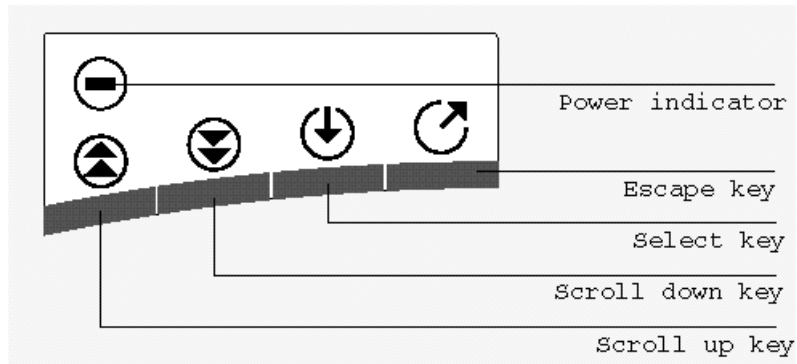


Figure 2-3. Keypad controls and indicators

Rear and Bottom Panels

The following connectors and features on the rear and bottom panels of the ProPalette unit are shown in Figure 2-4:

- a. Service port (for use by service technicians only)
- b. Parallel port
- c. Two SCSI ports (The SCSI ID number is selected via the keypad; see page 22.)
- d. Reset button
- e. Service port (for use by service technicians only)
- f. Power connector
- g. CRT access door (underneath unit)

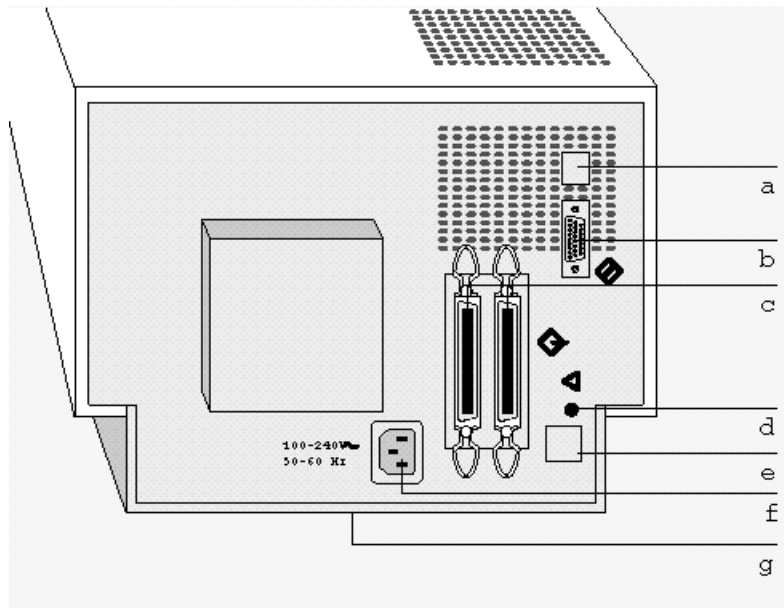


Figure 2-4. Rear and bottom panels

Connecting to a PC Parallel Port

Caution

All connections must be made with the power off on both the recorder and the computer. Pay strict attention to the sequence of instructions in this section. Failure to comply may result in damage to the computer and/or the recorder. Such damage is not covered by the warranty.

1. Turn off the computer and make sure the recorder power switch is in the Off (0) position (see the left panel of Figure 2-5).

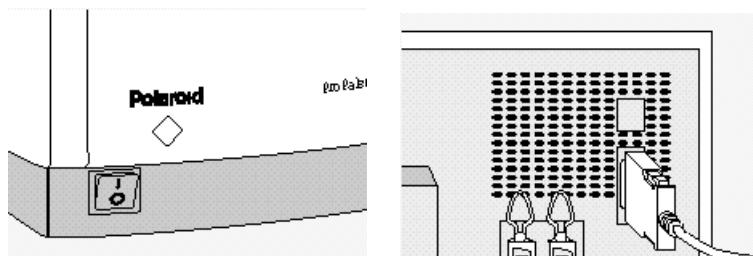


Figure 2-5. Connecting to the parallel port

2. Connect one end of the parallel cable to the parallel port of the recorder by squeezing the two side tabs, pushing the connector into the port, then releasing the tabs (see the right panel of Figure 2-5).
3. To connect the recorder to your computer, plug the other end of the cable into the parallel port. Fasten the connector with the two thumbscrews.

Connecting to a SCSI Interface

Warning

All connections must be made with both **ProPalette and computer power off**. Pay strict attention to the sequence of instructions in this section. Failure to comply may result in damage to the computer or the recorder. Such damage is not covered by the warranty.

The Polaroid ProPalette 8000 includes a SCSI interface (Small Computer System Interface), a standardized cable system and communications protocol that allows connection of up to seven SCSI peripheral devices to a computer.

The SCSI interface is standard for Macintosh computers. For the PC, you must have a SCSI host adapter installed in your computer. Support for SCSI host adapters is provided by the software application; consult your software documentation for up-to-date information on compatibility. See the instructions provided with the SCSI adapter for proper installation.

SCSI Guidelines

The SCSI system uses special cables and termination to achieve communication between the computer and peripheral devices. To function properly, the combined length of the entire cable system must not exceed 19 1/2 feet (6 meters) and must include the appropriate number of terminators. A SCSI chain must always be terminated at both ends. Incorrect termination can permanently damage the computer, film recorder, or any other device along the SCSI chain. Refer to the following guidelines and diagrams for more information.

Termination

The SCSI chain must be terminated at both ends of the chain. The beginning of the chain is typically the computer. In a PC, make sure the SCSI host adapter is terminated; see instructions for the SCSI adapter. (However, if you have an internal SCSI hard drive and only one SCSI adapter, then the hard drive should be terminated and not the adapter.) Most Macintosh computers include a hard disk which is internally terminated. (If your computer is not internally-terminated, you must place an external terminator on the first device after the computer, between the device and the SCSI cable to the computer.)

Intermediate devices in the chain should not be terminated. If you have an internally terminated device, place it at the end of the chain. (Check the manual for the device to determine whether it is internally terminated.) If none of your devices are internally terminated, place the external terminator provided on the last device.

The ProPalette is shipped with termination turned off. The recorder can be terminated externally by using the terminator provided, or internally by using the keypad as described in “Changing Termination” below.

Note

If you turn on internal termination, do **not** terminate externally.

PowerBook note: According to Apple Computer, even though this computer has an internal hard disk, you should treat it as an unterminated device. This means that you must have two terminators on the SCSI chain; for example, one on the end of the PowerBook pigtail and one on the ProPalette. The documentation included with your PowerBook has more information.

Macintosh IIfx: If you are connecting the recorder to a Macintosh that requires special termination, such as the Macintosh IIfx, use only the special black terminator shipped with the Macintosh IIfx.

Changing Termination

The ProPalette is shipped with termination off. If you wish to turn termination on internally (rather than use the external terminator), do the following:

1. Turn off your computer and all other SCSI devices.
2. Connect the power cord to the recorder and into a grounded power supply.
3. Turn on the recorder. After a moment, the message panel will display “Ready.”
4. Press the Escape key to get to the Change Setup menu. Press the Down key until “SCSI Terminated?” is displayed.
5. Press the Select key. Then press the Down or Up key to display “Yes.” (To return to termination off, select No.)
6. Press the Select key to enter your selection.
7. Press the Escape key twice to return to the “Ready” message.
8. Press the reset button on the back of the recorder, or turn the recorder off and on, for the selection to take effect.

Connection Tips

- When you connect or disconnect a SCSI device, make sure all SCSI devices have their AC power switched OFF.
- Always make SCSI connections firmly, connecting the clips or tightening the screws that secure cables and terminators. Most problems with SCSI devices are connection problems along the SCSI chain.
- Some devices, such as the ProPalette, have two SCSI ports. The cable can be connected to either port without affecting the performance of your equipment.
- Each device on a SCSI chain must have a unique SCSI ID number. These numbers are described in the following section.
- Wherever a 50-to-50 pin cable is required, be sure to use a cable which meets the SCSI-2 specification, such as an Apple cable.
- If you are using a PC, the ProPalette can be connected to two host computers at once; one via the parallel connector and one via the SCSI connector. The recorder will image in the order the signal is received.

Changing the SCSI ID**Caution**

To prevent damage to the hardware and software, read this section before turning on the system.

Each device on a SCSI chain must have a unique SCSI ID number from 0 to 7. The ProPalette is set at the factory to SCSI ID number 4. If this number conflicts with any other device on the SCSI chain, you must change either the SCSI ID number of the recorder or the SCSI ID number of the other device. Refer to the SCSI hardware manual for more information.

To change the SCSI ID number, do the following:

1. Disconnect the ProPalette from your computer and all other SCSI devices.
2. Connect the power cord to the recorder and into a grounded power supply.
3. Turn on the recorder's power switch. The ready message will be displayed.
4. Press the Escape key to reach the Change Setup menu. Press the Down key until "SCSI ID?" is displayed. Press the Select key; your current ID setting is indicated. Press the Down key until the desired number is displayed (a number from 0 to 7).

5. Press the Select key to enter your selection.
6. Press the Escape key twice to return to the Ready mode.
7. Press the reset button on the back of the recorder, or turn the recorder off and on, for the selection to take effect.

Caution

If two devices on a SCSI chain have the same SCSI ID number, neither will work correctly, and data may be damaged when you turn on the devices.

SCSI Connection Diagrams

A variety of system configurations is possible, depending on what peripherals are connected to the system used with ProPalette.

The diagrams below show many different combinations. Find the appropriate configuration for the hardware, and follow the connection diagram and instructions.

Recorder is Only SCSI Device

The internal SCSI hard disk or the SCSI host adapter is internally terminated. Therefore, you need to add the terminator to the recorder as shown in Figure 2-6 (between the cable and the recorder, or on the second SCSI port).

Note

If you prefer, you can turn the termination on internally, rather than use the external terminator. See “Changing Termination” on page 21.

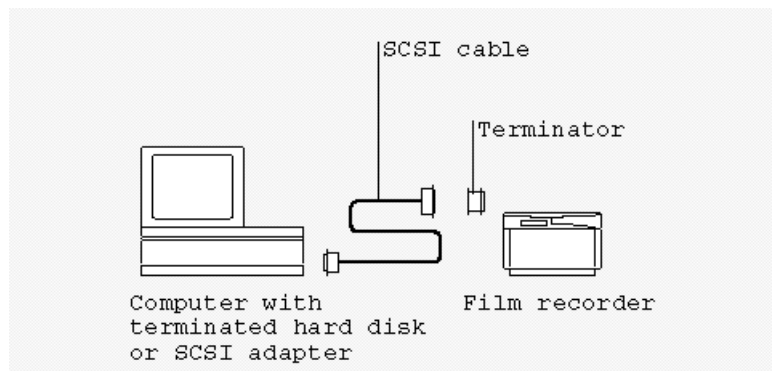


Figure 2-6. Connection when recorder is only SCSI device

Multiple External SCSI Devices, One Internally Terminated

Place the device with the internal terminator at the end of the chain (Figure 2-7) and do not add any additional terminators. If any other external device has an internal terminator, the terminator will have to be removed according to the manufacturer's directions.

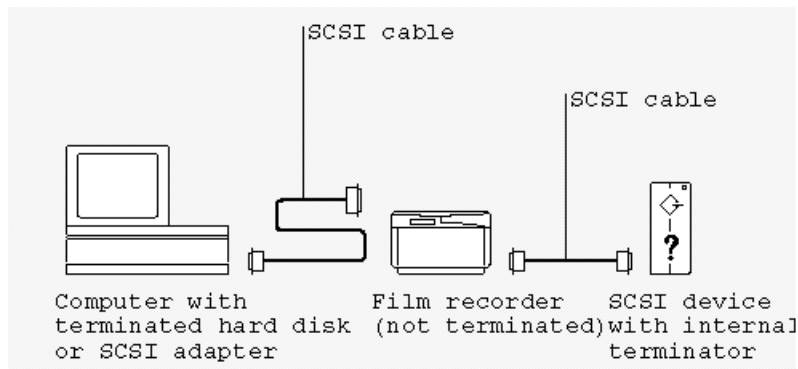


Figure 2-7. Connecting multiple external SCSI devices, one internally terminated

Multiple External SCSI Devices, None Internally Terminated

Place a terminator between the SCSI cable and the last external SCSI device on the chain (Figure 2-8). If one external device has an internal terminator, see the example above.

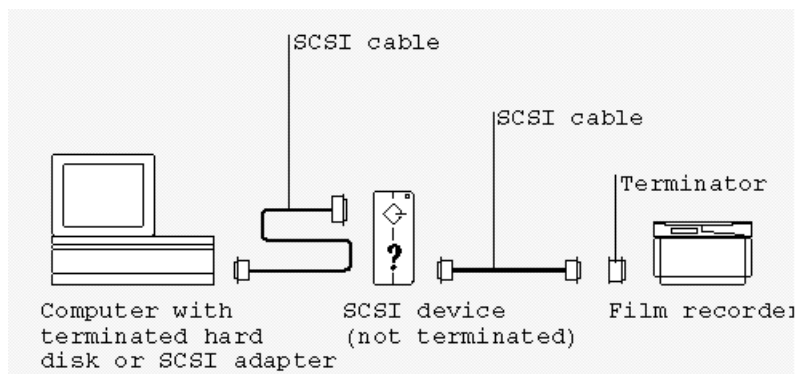


Figure 2-8. Multiple external SCSI devices, none internally terminated

Testing the Installation

To verify that the ProPalette hardware is installed correctly, make a test image by using the keypad. See “Testing the Hardware Installation” on page 31.

Using the 35mm Camera Back

35mm Camera Back Description

The 35mm camera back (Figure 2-9) provided with the recorder features automatic film loading, advancing and rewinding for maximum convenience. The camera can detect the length of the film, and counts frames as exposures are made. This information is displayed on the message panel for reference.

Refer to Figure 2-9 for the location of the following camera back components:

- a. Film door button
- b. Film ID window
- c. Film door
- d. Edge connector
- e. Lens
- f. Positioning pins

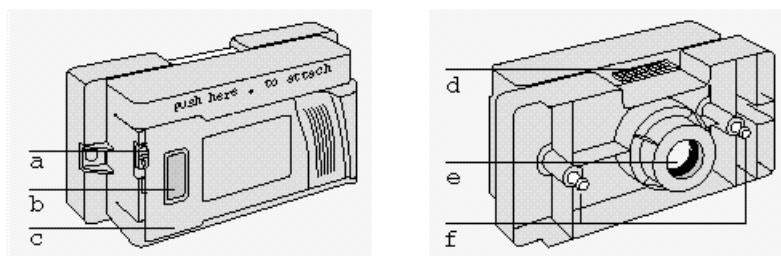


Figure 2-9. 35mm camera back

Loading 35mm Film

1. Turn the recorder on. Slide the film door button down (Figure 2-10, left) and open the door.

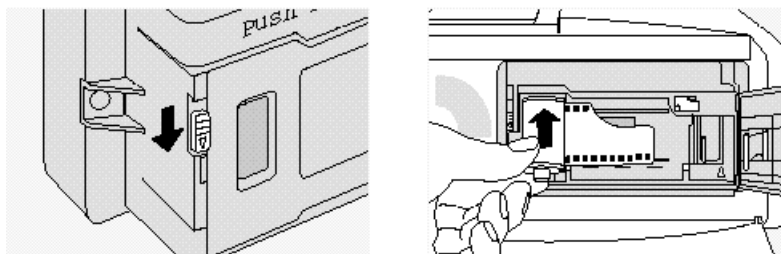


Figure 2-10. Opening the door and inserting the film cassette

2. Insert the film cassette at an angle into the chamber as shown in Figure 2-10 (right panel). The pin in the chamber fits into the hole on the bottom of the cassette. Push it all the way in, so that the film lies flat in the track. When loading Polaroid Polachrome film, remember that the emulsion (dull side) faces away from the lens. This is different from conventional film, in which the emulsion faces the lens.
3. Pull the end of the film out carefully, until the end is aligned with the white triangle at the lower right, near the take-up spool (**a** in Figure 2-11). If you pull it out too far, take the cassette out and wind the extra film back in by turning the black knob at the top of the cassette.
4. When the end of the film is properly aligned with the white triangle, close the film door until it clicks shut. The message panel will display “Loading film.” The film will automatically advance to the first exposure, and the message panel will display the number of frames available (for example, “24 Frames Left of 24” for a 24-exposure roll).

Note

You may be able to expose more frames than indicated by the film container. For example, you may be able to make 13 exposures on a 12-exposure roll. In this case, the message panel will display “13 Frames Left of 13.” The film unwinds to the end of the roll when first loaded, and winds back into the cassette frame by frame with each exposure. This lets the camera determine the actual number of exposures available, and it protects exposed images if the camera door is inadvertently opened.

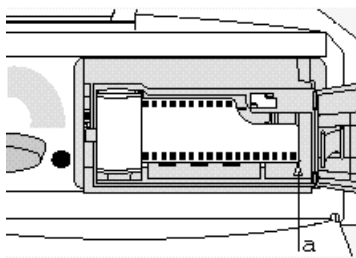


Figure 2-11. Aligning the end of the film

5. You can store the empty film box under the locking lever, then close the front door (Figure 2-12).



Figure 2-12. Closing the front door

Locking the Film Type Via the Keypad (Remote Users)

The film type must always be selected in the software, and it must match the film loaded into the recorder to ensure proper color balance and exposure. If the recorder is on a network, it may be inconvenient for remote users to confirm which film type is currently loaded into the recorder. If so, you can “lock in” the film type you have just loaded using the keypad. Doing so will prevent users from making exposures on the incorrect film type (an error message will alert the user).

When the film type is “unlocked” (not selected via the keypad), no error message is sent. In this case, remote users should check which film is loaded before imaging.

To lock the film type:

1. Press the Escape key to reach the Change Setup menu.
2. Press the Down key until “Lock Film Type?” is displayed. Press the Select key. “*Unlocked” or the name of the currently locked film is displayed.
3. Press the Down (or Up) key to display the film type that is currently loaded. Or, select Unlocked to allow any film type to be selected in the software.
4. Press the Select key to enter the selection. An asterisk (*) will appear next to your selection to indicate it has been selected. Press Escape twice to return to the Ready message.

Using Polaroid Polachrome Instant Film

It is more convenient to process Polaroid Polachrome HC instant 35mm film if there is a short length of film (a “leader”) remaining after the roll is exposed. To set the camera back to leave a leader when rewinding, do the following:

1. Press the Escape key to reach the Change Setup menu.

2. Press the Down key until “Leave Leader?” is displayed.
3. Press the Select key, then press the Down key to display “Yes.”
4. Press the Select key to enter the selection. Press Escape twice to return to the Ready message.

Note

Remember to select No under “Leave Leader?” when you reload conventional 35mm film, which should be completely rewound when exposed.

Making Exposures

Once you have loaded the film, the Ready status message will be displayed on the message panel. You are now ready to begin initiating exposures from the software. (Be sure to select the correct film type in the software.)

When you begin your first exposure, the unit may do a brief calibration routine first (the message panel will display “Calibrating,” then “Calculating Grid”).

During the exposure, the message panel will display “Exposing RED,” “Exposing GREEN,” and “Exposing BLUE” as it exposes the three color components of your image through the three filters.

After each exposure, the panel will count down the frames available (for example, “23 Frames Left of 24”). When the last exposure is finished, the message panel will display “Out of Film.” Remove the exposed film as described in the following section.

Note

When you turn off the recorder with a partially exposed roll loaded, the recorder keeps the status information in memory and will redisplay the correct frame count when you turn on the recorder again.

Removing Exposed Film

When you are finished exposing a roll of 35mm film, the camera will automatically rewind the film. The message panel will then display “Out of Film.” Open the front door of the recorder, open the film door, and remove the film cassette. The film should be completely rewound into the cassette except when using Polaroid Polachrome HC instant 35mm film; see “Using Polaroid Polachrome Instant Film” on page 27.

Removing a Partially Exposed Roll

To rewind a partially exposed roll of film, press the Escape key to display the Change Setup menu. Press the Down key until “Rewind Film” is displayed. Press the Select key. The film will rewind, and the message panel will display “Out of Film” when done. Remove the film.

Note

Do not try to reinstall a partially exposed roll of film.

Cancelling an Exposure

If you change your mind about exposing a particular image, you can interrupt the exposure in mid-cycle instead of waiting for the exposure to finish. Press the Escape key to display the Setup menu. Press the Down key until “Cancel Exposure?” is displayed. Press the Select key and the exposure will be halted. The film will be advanced for the next exposure.

Advancing Film

If you need to advance film (leave unexposed frames) during a session, press the Escape key to display the Change Setup menu. Press the Down key until “Advance Film?” is displayed. Press the Select key; the film will advance one frame. To advance the film by more than one frame, repeat this sequence the desired number of times.

Note

This option is useful if a power failure occurs during an exposure. Advance the film by one frame, then reshoot the image on the next frame. Or, if you accidentally opened the film door when a partially exposed roll was loaded, advance the film by a few frames to bypass the light-fogged area of film.

Removing and Replacing the 35mm Camera Back

To remove the 35mm camera back:

1. Open the front cover of the recorder.
2. Move the locking lever to the unlocked (○) position (Figure 2-13, left).
3. Carefully pull the camera back straight off (Figure 2-13, right). Replace the lens cap, which is stored in the front cover, while the camera is not in use.

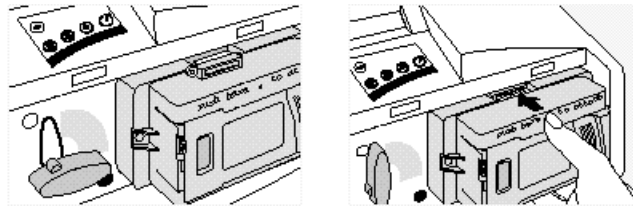


Figure 2-13. Removing and replacing the camera back

To replace the camera back:

1. Remove the lens cap and store it in the holder in the front door.
2. Be sure the locking lever is set to the unlocked (○) position.
3. Push the 35mm camera back gently but firmly onto the mounting plate so the positioning pins fit in the holes, and so the edge connector fits snugly into the slot in the recorder. Turn the locking lever to the locked (●) position.

Protecting the CRT and Camera from Dust

Follow these guidelines to protect the CRT and camera from dust:

- Keep a camera back on the unit when it is not in use.
- When the camera back is not mounted on the recorder, use the lens cap provided.

Cleaning the CRT Face

The CRT inside the recorder has an anti-static coating to help protect it from smoke and dust particles. But if dust appears on the CRT, clean it as follows.

1. Turn the power off and disconnect the power cord.
2. Turn the recorder on its side.
3. Unscrew and remove the access door on the bottom.
4. Carefully reach in and remove the dust on the surface of the CRT with a dry cotton swab (Figure 2-14). Avoid touching the filter wheel and filters.

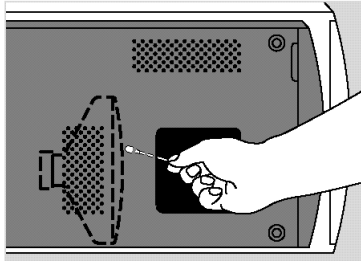


Figure 2-14. Cleaning the CRT face through the bottom access door

Cleaning the Camera Lens

Remove the 35mm camera back as described on page 29 and hold it with the lens facing up. Remove as much dirt as possible with an aspirator, pressurized air, or a camel hair brush, available at a camera store. If necessary, wipe the lens with a cotton-tipped swab moistened with lens cleaner (Figure 2-15). Do not soak the swab so that the lens is flooded with cleaner. Examine the surface of the lens for scratches and replace it if any are found.

Caution

When cleaning the lens, do **not** use strong detergent solutions, abrasives of any sort, or aromatic solvents such as acetone or MEK.

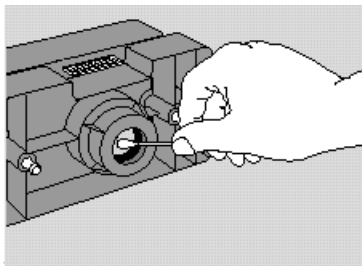


Figure 2-15. Cleaning the camera lens

Testing the Hardware Installation

To test that your recorder is imaging properly, you can use the keypad to initiate a test image that does not require connection to a computer.

1. To check that the recorder is going through an exposure cycle, remove the 35mm camera so you can observe the CRT through the lens opening in the recorder.

2. With the Ready message displayed, press the Escape key to reach the Change Setup menu.
3. Press the Down key until “Diagnostics?” is displayed. Press the Select key, then press the Down key to display “Expose Test Image?”
4. Press the Select key to begin the test exposure cycle and look at the CRT through the camera opening. You will see a row of red spots moving down the screen, and a horizontal line flashing intermittently. Then this cycle will repeat through the green and blue filters. (Figure 2-16 shows the image this pattern would create on film.)

If you do not see the spots and horizontal line described in step 4, there is a problem with the hardware or hardware installation. Check your cable connections before looking further.

If the test was successful but you cannot image from a software package, the problem could be software-related. Please check the software manual or contact the manufacturer of the application software.

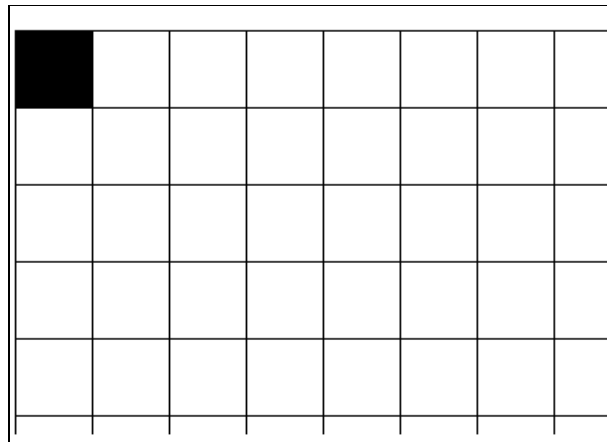


Figure 2-16. ProPalette test image

Troubleshooting Hardware and Film Problems

This section describes symptoms and solutions for problems with hardware setup and use of the 35mm camera/adaptor. Refer to the software manual for troubleshooting software problems. Also refer to Chapter 4 for additional troubleshooting information.

Black image (film not exposed): The shutter did not open, or the lens cap was left on the camera.

Random black spots: Caused by dirt specks on the CRT. Clean the CRT as described on page 30.

Dark, or pale colored horizontal lines across image: Make sure the recorder is properly grounded (including extensions and multiple outlet strips), use only the cables supplied with the recorder, and protect the unit from bumps and vibrations during exposure.

Image too light or dark; incorrect color balance: Make sure the correct film type has been specified in the software; see the software instructions for details.

Color Balance and Exposure for Negative Film

When using color negative film, color balance and exposure can vary over a wide range due to the variability of processing and printing at the processing lab. If exact color matching is important, shoot the test image at the beginning of each roll and have a custom lab calibrate the equipment to that image for color balance and exposure before printing the roll. The image is equivalent to an 18% gray card.

Macintosh users: The test image GRAYCARD is in the Print Me Later folder.

PC users: The test image GRAYCARD.TIF is copied onto your hard drive at installation. Import this file into your application software for imaging.

Running a Self-Test

If you wish to run the diagnostic self-test that the recorder performs at power-up without turning the recorder off and on again, you can do so using the keypad.

Press the Escape key to reach the setup menu. Press the Down key until “Diagnostics?” is displayed. Press the Select key, then press the Down key to display “Run Startup Diags?” Press the Select key to begin the brief self-test.

Redisplaying an Error Message

When the system detects one of a number of hardware or software problems, it briefly displays an error message on the message panel. The same message may also appear on your computer. The recorder will automatically reset.

If the problem persists, press the Escape key to reach the setup menu. Press the Down key until “Diagnostics?” is displayed. Press the Select key, then press the Down key to display “Show Last Error?” Press the Select key; the most recent error message will be displayed for your reference.

LCD Panel Messages

<i>The message:</i>	<i>is displayed when:</i>
Ready x Frames Left of Y	Unit is ready to expose. Film is loaded and there are frames left to expose (where x is the number of frames left and y is the length of the roll). Note: To reach Change Setup? press Escape (see the following section, “Setup Menu Reference”).
Loading Film	Film is being loaded after the film door is closed
Calibrating/ Calculating Grid	You initiate the first exposure of each session, and as necessary after that. “Calculating Grid” appears only when resolution has changed.
Exposing RED	The red data is being exposed through the red filter.
Exposing GREEN	The green data is being exposed through the green filter.
Exposing BLUE	The blue data is being exposed through the blue filter.
Rewinding Film	Film is being rewound at the end of the roll, or after you select Rewind Film? to rewind a partially exposed roll (see the following section, “Setup Menu Reference”).
Out of Film	Film is completely exposed and ready to be removed, or no film is loaded.
Change Setup?	You press Escape from the Ready message. Select this to change setup (see the following section, “Setup Menu Reference”).
[One of several error messages]	There is a problem with the recorder or the software. The recorder will automatically reset. To view the error message again, see “Redisplaying an Error Message” on page 33.

Setup Menu Reference

To reach the Setup menu, press Escape at the “Ready” message.

<i>Menu Options</i>			<i>See page</i>	
⬇ Change Setup?	⬇ *Unlocked	⬇		27
⬇ Lock Film Type?	⬇ Film type 1	⬇	⬇	
	⬇ Film type 2	⬇	⬇	
	⬇ “	⬇	⬇	
	⬇ “	⬇	⬇	
⬇ Rewind Film?	⬇			29
⬇ Advance Film?	⬇			29
⬇ Abort Exposure?	⬇			29
⬇ Leave Leader?	⬇ No		⬇	27
	⬇ Yes	⬇	⬇	
⬇ SCSI ID?	⬇ [current #]	⬇	⬇	22
	⬇ *4	⬇	⬇	
	⬇ 5	⬇	⬇	
	⬇ 6	⬇	⬇	
	⬇ 7	⬇	⬇	
	⬇ 1	⬇	⬇	
	⬇ 2	⬇	⬇	
	⬇ 3	⬇	⬇	
⬇ SCSI Terminated?	⬇ *No		⬇	21
	⬇ Yes	⬇	⬇	
⬇ Diagnostics?	⬇ Expose test image?	⬇		33
	⬇ Run Startup Diags?	⬇		
	⬇ Show Last Error?	⬇		

Please note:

Legend

- ⬆ Up
- ⬇ Down
- ⬇ Select
- ⬇ Escape

- If no key is pressed within a few seconds, “Change Setup?” changes to “UP DN SEL ESC” to help you identify the keys.
- If no key is pressed for several seconds while in the setup mode, the display automatically returns to the ready mode. Press Escape again to return to the setup mode.
- After making a selection, press Escape until the Ready message appears.
- Wherever the Down key is shown, the Up key can also be used to scroll through options.

3. Theory of Operation

Overview

The goals of ProPalette design are as follows:

- Include all the capabilities of Polaroid's previous film printers (continuous and variable resolution from 256 to 4k)
- Provide camera back zoom and offset adjustment
- Support parallel and SCSI ports
- Improved image quality (sharpness, geometry, vignetting)
- Improved manufacturability
- Reduced exposure times

ProPalette design has improved image quality as follows:

<i>Image Quality Parameter</i>	<i>Method of Improvement</i>
Sharpness	7-inch CRT
Geometry	Direct digital control of horizontal and vertical deflection via D/A converters
Vignetting (dark corners)	Direct digital control of cosine ⁴ signal via D/A converter

Manufacturability and serviceability have been improved by eliminating all potentiometers and eliminating the need to use magnets on the deflection coil. In addition, a new automatic alignment system uses a CCD camera, a desktop computer and specially developed alignment software to determine optimum geometry settings and focus voltages for each unit. After the optimum settings have been determined, the values are stored in the ProPalette's flash memory.

Exposure times have been reduced by exposing each pixel line in a single horizontal scan. (Earlier Polaroid film printers use multiple horizontal scans for each line.)

CPU

ProPalette's CPU is a V53 (Intel 186 compatible) with a TI DSP. It also has 4 megabytes of DRAM (expandable to 14 megabytes at the factory), and a field-upgradeable 512 kilobyte flash firmware memory.

Deflection and Geometry Control

Pixel deflection is controlled digitally via a 2D lookup table, 16-bit DAC, sample and hold and a low-pass filter. Instead of magnets on the CRT yoke, ProPalette corrects geometry (pincushion) digitally through the 2D, 16-bit lookup table customized at the factory for each unit and stored in flash memory.

Sharpness Control

The ProPalette provides dynamic focus through a 2D lookup table and a 12-bit DAC. The lookup table is customized for each unit at the factory and stored in flash memory. The system also reduces pixel degradation in the corners by correcting for spot astigmatism with internal neck magnets.

Exposure Control

ProPalette controls exposure as follows:

<i>Exposure Parameter</i>	<i>Control Method</i>
Pixel brightness	Intensity-modulated 1D lookup table and 16-bit DAC
Compensation for CRT brightness drift (Autoluma)	12-bit ADC with 8-bit gain control, providing more than 20 bits of dynamic range. Brightness is checked before each exposure and corrected when necessary.
Compensation for CRT phosphor color balance drift	Periodically recalibrated via photocell viewing CRT through the filters.
COS ⁴ (compensation for brightness fall-off at corners)	2D lookup table and 12-bit DAC. (Lookup table customized at the factory for each unit and stored in flash memory.)

ProPalette Major Systems

The ProPalette uses the major hardware systems in Table 3-1 to create images on photographic film. The systems are interconnected as shown in the block diagram in Figure 3-1.

Table 3-1. ProPalette Systems

<i>System</i>	<i>Function</i>
Filter Wheel Assembly	Places appropriate color filter between the CRT and camera lens upon command from the Digital board. Provides wheel-position data to the Digital board via a photo-interrupter that detects notches in the filter wheel.
Low-Voltage Power Supply	Converts line voltage to supply necessary power to the other ProPalette components
High-Voltage Power Supply	Provides high voltage (2,000-10,000 volts) to the CRT.
Digital Board	Contains the ProPalette CPU, flash memory, EPROM, DRAM. The Digital board digital signal processing (DSP) subsection provides CRT horizontal deflection, vertical deflection, video and dynamic focus data to the Analog board. Modules on the Digital board also control the camera, LCD and keypad, filter wheel and photo-interrupter.
Analog Board	Uses input from the Digital board and Autoluma board to produce output for producing an image on the CRT assembly.
Autoluma Board	Monitors CRT illumination using a photodiode and provides controls to maintain correct CRT brightness.
CRT	Displays an image from analog board input.
Camera	The camera focus the CRT image onto the film. It also advances and rewinds the film when commanded by the Digital board.
LCD/Keypad Assembly	Displays status indicators and error messages on an LCD display. Also allows operator to enter commands and change options from menus via a four-key keypad. Interacts with the LCD/keypad module on the Digital board.

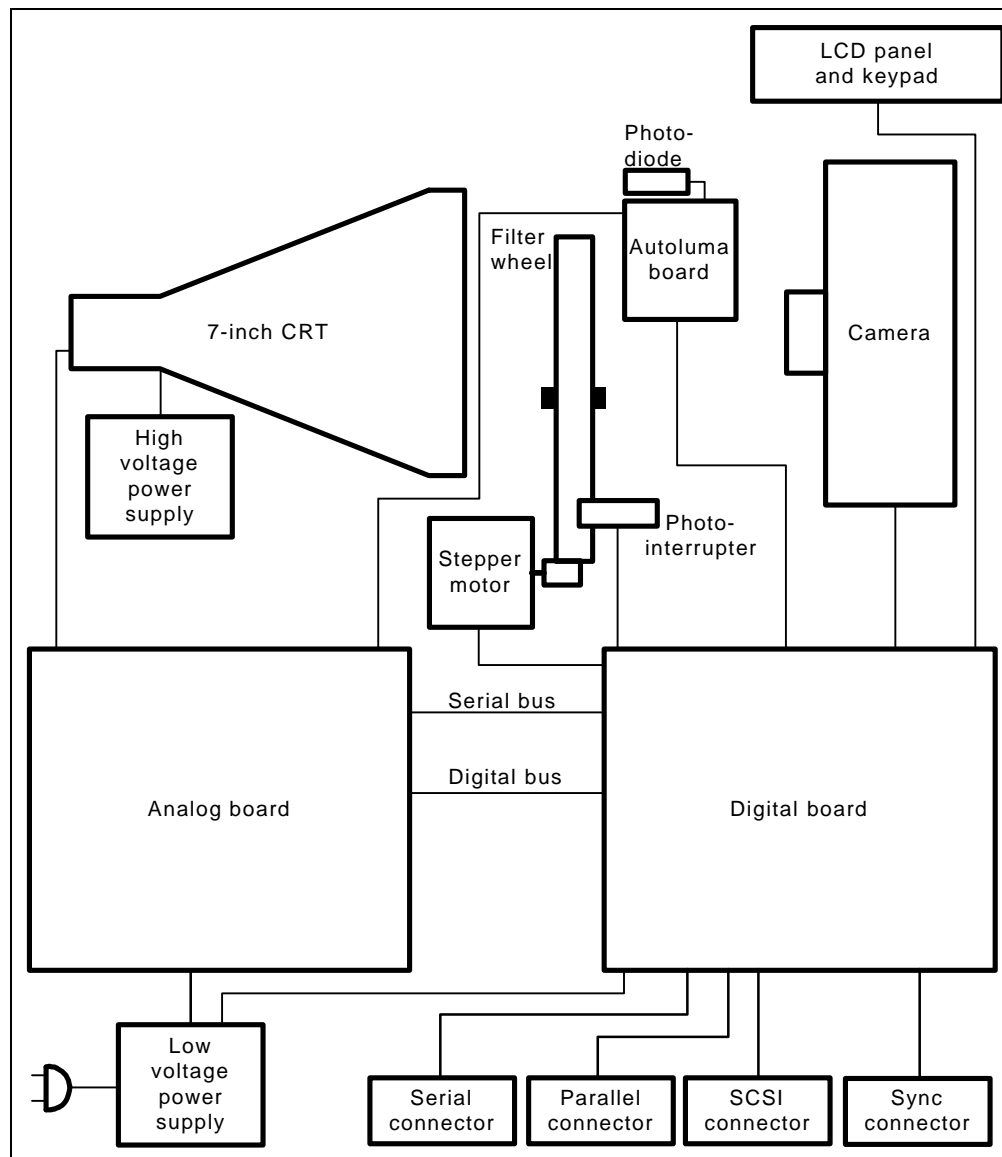


Figure 3-1. ProPalette systems block diagram

Exposure System

Exposure Sequence

ProPalette uses photographic film's latent memory to record light and to blend the shapes and colors from a sequence of colored exposures. The exposures are made from black-and-white, computer-generated video scan lines.

Upon command from the host computer, ProPalette creates a black-and-white video scan line for a specified amount of time on the CRT. When projected onto film through lenses and colored filters, a series of these scan lines creates a full-color image on the film. This sequential exposure technique combines exposures of each primary color to produce almost any shade or hue.

Exposure System Components

Figure 3-2 shows a simplified representation of the ProPalette exposure system. It consists of a camera back/adapter assembly, a filter wheel assembly, a filter wheel photo-interrupter that provides wheel position information, an autoluminance photodiode assembly to sense CRT brightness, and the CRT assembly.

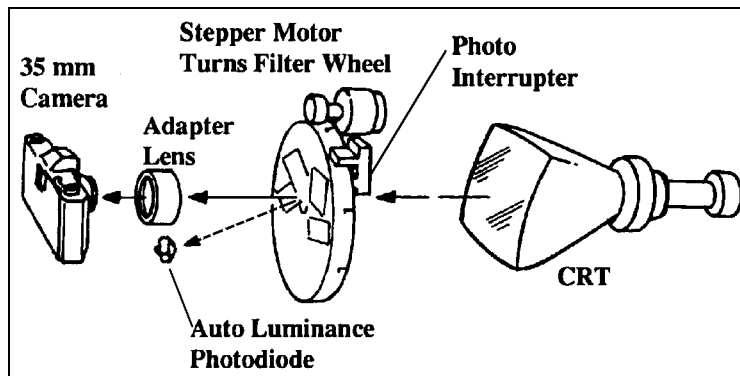


Figure 3-2. ProPalette exposure system

Camera Back/Adapter Assembly

Four camera back assemblies are available for use with ProPalette:

- 35mm
- 6x7
- 6x8
- 4x5 (all Polaroid 4x5 films)

Each camera back includes a fixed-focus, fixed-aperture lens. (ProPalette controls exposure via the intensity and duration of the CRT scan lines.)

Filter Wheel Assembly

The filter wheel assembly positions the appropriate colored filter (red, green or blue) between the CRT and the film. Filter movement is initiated by the host computer, which issues a command to ProPalette to rotate the filter wheel until the appropriate filter is in position.

The filter wheel has four positions:

Position 1. Red filter (start position)

Position 2. Green filter.

Position 3. Blue filter.

Position 4. Opening without a filter, for viewing the CRT during testing and calibration.

If a command from the host computer requires the filter wheel to turn to a higher filter position, the filter wheel rotates directly to the specified position. If the instruction is to a lower filter position, the microprocessor control circuit directs the filter wheel to rotate to the start (1) position, and then to the requested position.

Filter Wheel Photo-Interrupter

On the rim of the filter wheel are notches that are detected by the filter wheel photo-interrupter. The photo-interrupter contains a LED and a photo-transistor. When a notch on the filter wheel passes between the LED and the photo-transistor, the photo-interrupter generates a pulse that is detected by the microprocessor control circuit.

By counting the pulses from the photo-interrupter, the microprocessor on the ProPalette digital board determines the position of the filter wheel and starts or stops the stepper motor as necessary to position the filters correctly.

Filter Wheel Stepper Motor

The filter wheel stepper motor rotates the filter wheel assembly using a small rubber roller on the motor shaft. Using information from the filter wheel photo-interrupter, the microprocessor control circuit on the digital board increments the stepper motor as needed to move the filter wheel to the proper position.

Autoluma Board

The autoluma board consists of a photo-diode and associated circuitry. In conjunction with the autoluminance network and the microprocessor control circuit on the digital board, the autoluma board monitors and sets optimum CRT brightness before every exposure.

Power Supply

AC Power

ProPalette operates with domestic or international commercial AC power applied through the main power switch and the voltage selector.

Note

ProPalette meets domestic and international power requirements. It automatically operates from 100/115 to 220/240 volts at 50/60 Hz commercial AC power.

When the main power switch is on, AC power is applied to the low voltage power supply. The LED on the front of the ProPalette unit indicates that the unit is powered.

DC Power

Regulated DC voltages are generated from the low voltage power supply and are applied to the ProPalette through connectors J31 and J32 to the analog board and through J4 to the digital board. These voltages power the following:

- Digital board
- Analog board
- Hi Voltage Power Supply
- Filter wheel stepper motor
- Camera back via connector
- Small System Computer Interface (SCSI)

The DC power system is shown in Figure 3-3.

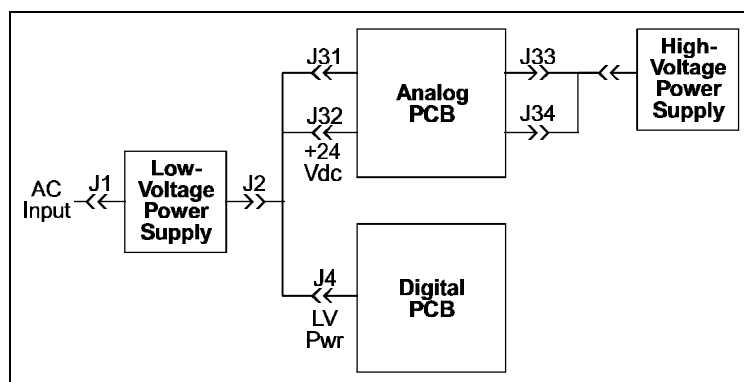


Figure 3-3. Power supply interconnection diagram

Digital Board

Digital Board Circuits

The ProPalette digital board contains circuitry for communicating with the host computer and controlling operations and executing commands from the host computer software. The digital board circuits are:

- Microprocessor control network
- Erasable programmable memory (EPROM)
- Random access memory (RAM)
- Video signal generation
- Vertical deflection
- Horizontal synch signal generation
- Autoluminance (CRT brightness)
- ProPalette operations (camera back, stepper motor, filter wheel position sensing)

Digital Board Components

The digital board has the following components, also shown in Figure 3-4.

- NEC V53 micro-controller (main processor or CPU)
- Serial port (internal to the V53)
- RS232 driver/receiver
- I/O decoding logic
- Boot/monitor EPROM
- DRAM controller, 4MB base DRAM and two DRAM SIMM sockets for up to 10MB of additional DRAM
- 512KB flash memory
- TI TMS320C26 DSP
- DSP I/O decoding logic
- Two 8Kx8 high speed SRAMs
- Multiple data latches between the V53 and DSP
- Camera back interface with DX code support
- Color filter wheel driver circuit

- LCD/keypad interface
- SCSI port (SCSI-2 compatible) with active terminators
- Parallel port with standard Centronics compatibility and an expansion connector with access to the V53 data bus, address bus and control signals.

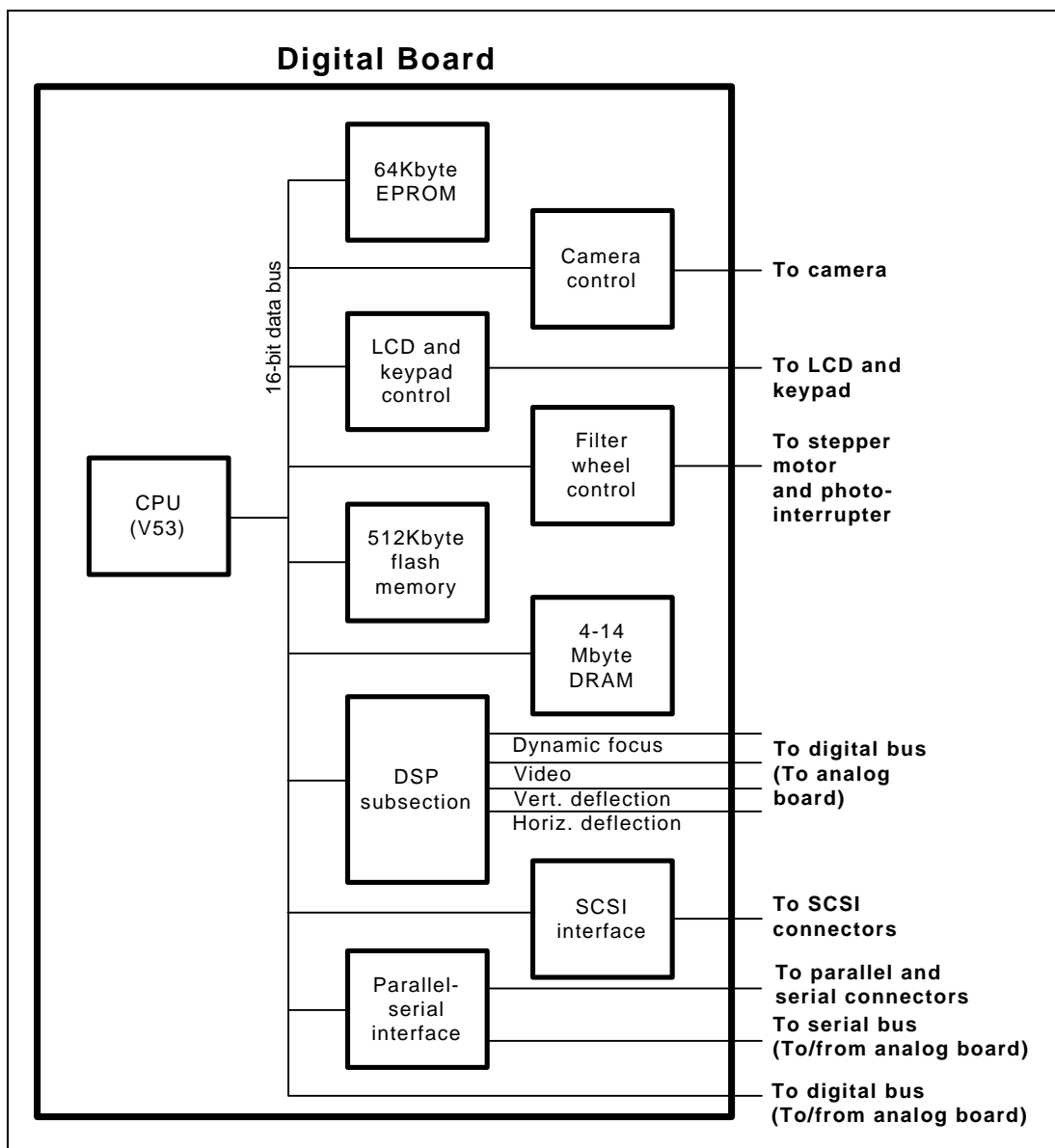


Figure 3-4. Digital board block diagram

Digital Board Functional Groups

Digital board functions have been classified into four groups as shown in Table 3-2.

Table 3-2. Digital board functional groups		
Group No.	Description	Functions
1	Must be operational for the system to work at the lowest level. (If any function in this group is inoperable, the digital board cannot communicate with the host system, even at the lowest level.)	<ul style="list-style-type: none"> • V53 CPU • EPROM • I/O decoding logic • RS232 driver/receiver
2	Do not require special external hardware to verify (tested by on-board CPU).	<ul style="list-style-type: none"> • First MB of DRAM and associated logic • Remaining DRAM (3-13MB) • 512KB flash memory • DSP and communications with V53 • 8K word DSP SRAM
3	Require parallel and SCSI interface hardware and test software on the host PC (tested by connecting the digital board to a PC with parallel and SCSI cables, then running programs to verify communication between the PC and digital board).	<ul style="list-style-type: none"> • Parallel port • SCSI port
4	Cannot be tested by the on-board CPU or host PC, but are tested implicitly during ICE testing.	<ul style="list-style-type: none"> • Filter wheel stepper motor control • Camera back interface circuit • LCD/keypad module interface • Analog board data and control I/O • Sync (alignment) outputs

Group 1 Functions

Flash Memory

512KB of Flash memory is used to store the firmware, film tables, CRT calibration data, autoluma data, the frame count, SCSI bus ID and various other volatile data types. At power-on, the film printer copies the firmware from Flash memory to DRAM and runs it.

The current Digital Board design employs a single 5V-only flash chip that sits on the V53 buffered data bus. The chip, an AM29F400T, is used exclusively in the byte mode. The V53 address lines connect to the address inputs and the V53 memory read and memory write outputs drive the flash output enable and write enable inputs. The RCTL1WT PAL asserts a chip select signal, whenever the V53 addresses the upper 2Meg of its 16Meg address space.

V53 Timer0 (Real Time Ticker)

The V53 has several internal timers including Timer0 which is used to generate a periodic OS interrupt or clock tick.

Group 2 Functions

DSP and Communications with V53 and DSP SRAM

A diagnostic routine built into the firmware verifies the DSP is working, checks all of the communications between the V53 and the DSP and tests the 2 8Kx8 DSP SRAMs.

When the DSP is in the 'hold' state, the V53 has direct access to the DSP SRAM and the DSP I/O devices.

DSP related PALS:

DSPIO decodes the I/O space of the DSP and contains logic to perform the pixel-to-video translation.

SRDSP drives the SRAM msb address line and the SRAM control lines. The hi address lines are normally a direct copy of the DSP address lines. During a pixel transfer cycle, the hi address lines are all high so the pixel translation table in SRAM is accessed. The pixel translation table, by convention, resides in the last 256 locations of SRAM. This PAL also generates signals to load the deflection and video DACs, control the sample/holds, and to load the Cos⁴ and dynamic focus DACs on the Analog Board.

Group 3 Functions

Parallel Port, J19

Parallel port hardware consists of the ECP_PORT PAL (Lattice pLSI1016-60), one 74ACTQ646 8-bit bi-directional bus transceiver, one 74AC245 8-bidirectional buffer and one 74ACTQ244 8-bit buffer. The ECP_PORT PAL sits on the V53 buffered data bus. V53-PAL communications are handled via a dedicated V53 I/O address signal generated by the IODECODE PAL.

The 8-bit bus transceiver, which sits on the lower 8 bits of the V53 data bus is the ECP data I/O port. V53 I/O reads and writes and DMA reads are supported. The ECP_PORT PAL generates all control signals for the data port. The 8-bit bi-directional buffer simply copies the data lines during DMA transfers. The 8-bit buffer handles parallel port input and output control signals. Every parallel interface control signal and data line is connected to a termination network, RP701.

SCSI Port, J14

SCSI port hardware consists of a XX53C94 SCSI controller I.C., a UC5601 active terminator I.C. and a 20 pin resistor pack. The SCSI controller is connected to the V53 data bus, the V53 buffered data bus and four V53 address lines. Every SCSI signal line is pulled up to Vcc through a 20K resistor -- this scheme commits all SCSI bus signals in the case where no SCSI cable is attached and the active terminators are disabled.

Group 4 Functions

Filter Wheel Stepper Motor Control, J5 & J6

Two high-voltage, medium current dual peripheral drivers (75477) generate PHASE1/PHASE2 and PHASE3/PHASE4 which turn on and off current in four stepper motor windings. One side of each stepper motor winding is tied to +15Vdc and the other side attaches to the low-side drivers (PHASEX). PHASE1 and PHASE 2 should always be the complement of each other.

The same relationship applies to PHASE3 and PHASE4. Three 82C55 output bits control the peripheral drivers. INTLED provides current for an LED photo-interrupter which outputs a logic signal, FWSENSE, to indicate when a filter wheel slot is front of the sensor. FWSENSE is fed to an 82c55 input bit.

Camera Back Interface Circuit, J13

The camera back interface is made up of one 74VHC244 8-bit buffer, one 74HC273 8-bit latch, one 74HCT257 quad 2-to-1 mux, one LM311 comparator, two 75477 medium current low-side drivers, one 2SA1314 PNP power transistor, one 754410 (or L293D) dual half H-bridge and one LM317 linear voltage converter. The 8-bit buffer serves as an input port for signals output from the camera back. DX code bits are selected for reading via the 2-to-1 mux.

Both the 8-bit buffer and the 8-bit latch sit on the V53 buffered data bus, VBD7-0. The IODECODE PAL generates signals for reading and writing the camera I/O port. The 8-bit latch controls the camera shutter and film motor via control outputs fed to the 2 low-side drivers, the dual half H-bridge and an open-collector driver connected to the base of the PNP power transistor. The remaining 8-bit latch bits serve as the select bit for the 2-to-1 mux and the perforation sensor LED On/Off control. The comparator translates the perforation signal from the camera to a valid logic level. The voltage converter steps 15Vdc down to 6.4Vdc to supply the half H-bridge output driver.

LCD/Keypad Module Interface, J12

This interface consists of one 8-bit 82C55 port for LCD module data bus lines, four more 82C55 outputs for LCD module and backlight control, four 82C55 inputs for reading keypad keys, one 2SA1314 PNP power transistor for driving the LCD backlight and 1/2 a 74HC20 4-input NAND gate for generating a key interrupt to the V53.

Analog Board Data and Control I/O, J18

The Digital Board outputs a number of data and control signals which connect to devices on the Analog Board. Two 74VHC374 8-bit latches buffer the DSP data bus and drive the 64-pin ribbon cable. The DSPBUF PAL decodes several DSP I/O addresses and generates clock signals and control bits used on the Analog Board. The SRDSP PAL generates a number of clocks for video, deflection and Cos⁴/dynamic focus DAC latches. SRDSP also outputs control signals for sample/holds on the video and deflection channels. The IODECODE PAL generates three signals for serial loading of an 8-bit trim DAC chip.

The remaining I/O signals connect to Digital Board components shown on the following page.

Outputs					
BDD0	U414-19	J18-1	LD_0	U413-21	J18-36
BDD1	U414-16	J18-3	LD_1	U413-23	J18-37
BDD2	U414-15	J18-5	Vcc		J18-29, 30
BDD3	U414-12	J18-7	DACL_SERCLK	U305-11	J18-38
BDD4	U414-9	J18-9	/VBLANK	U307-8	J18-40
BDD5	U414-6	J18-11	TDAC_DAT	U302-15	J18-41
BDD6	U414-5	J18-13	/TDAC_LD	U302-7	J18-42
BDD7	U414-2	J18-15	TDAC_CLK	U302-19	J18-43
BDD8	U415-19	J18-17	C4DF_CLK	U413-25	J18-45
BDD9	U415-16	J18-19	/C4_CS	U416-16	J18-46
BDD10	U415-15	J18-20	/DF_CS	U416-7	J18-47
BDD11	U415-12	J18-22	/C4DF_WR	U416-9	J18-48
BDD12	U415-9	J18-23	/SYS_RESET	U304-7	J18-49
BDD13	U415-6	J18-25	HV_ON	U305-15	J18-50
BDD14	U415-5	J18-26	ADC_CLK	U101-29	J18-51
BDD15	U415-2	J18-28	ADC_DX	U406-54	J18-54
DEFL_CLK	U416-30	J18-32	ACTL2	U410-16	J18-57
VID_CLK	U416-26	J18-33	DEFL_SH_OUT	U416-24	J18-62
/LD_CLK	U413-19	J18-35	VID_SH_OUT	U416-36	J18-64

Inputs					
DACL_SERDAT	U306-28	J18-39	ADC_FSR	U406-25	J18-53
SCAN_FAIL	U306-22	J18-60	ADC_DR	U406-24	J18-55
POWER_FAIL	U306-21	J18-61			

Sync Outputs, J20

Two signals are output to a modular connector for synchronizing an external CCD camera with the film printer slow scan. /VBLANK_SYNC provides a frame sync and /DSP_XF provides a line sync.

Outputs		
/VBLANK_SYNC	U410-18	J20-1
/DSP_XF	U106-6	J20-3
GND		J20-2,4

Analog Board

The ProPalette analog board contains all the D/A and A/D converters required for full digital control of the CRT deflection, luminance, video and focus. A single 64-pin ribbon cable connects the analog board to the digital board. This cable carries a 16-bit bus (a buffered version of the DSP data bus) and various control signals.

Figure 3-5 shows a block diagram of the analog board.

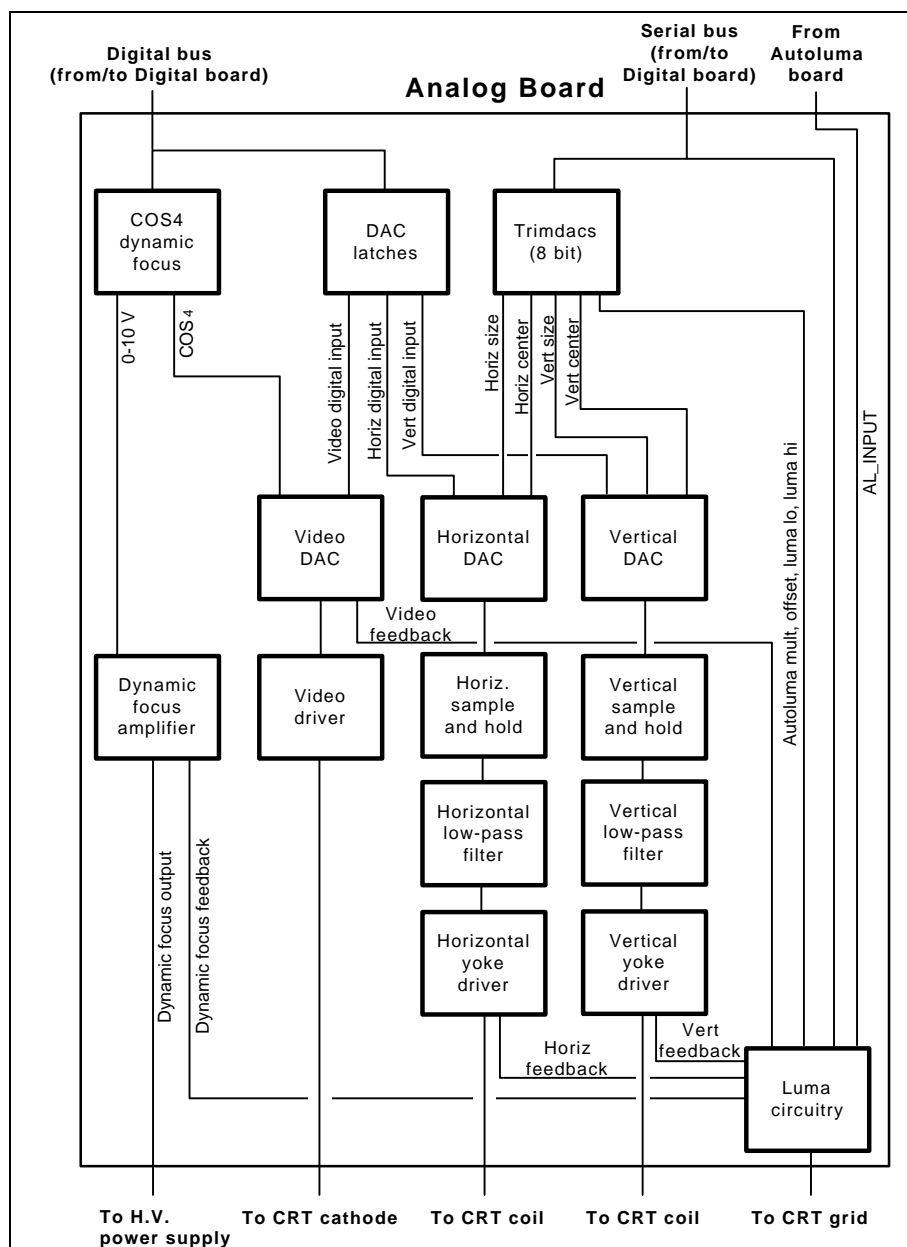


Figure 3-5. Analog board block diagram

The analog board also contains the autoluma circuitry, shown in the block diagram in Figure 3-6.

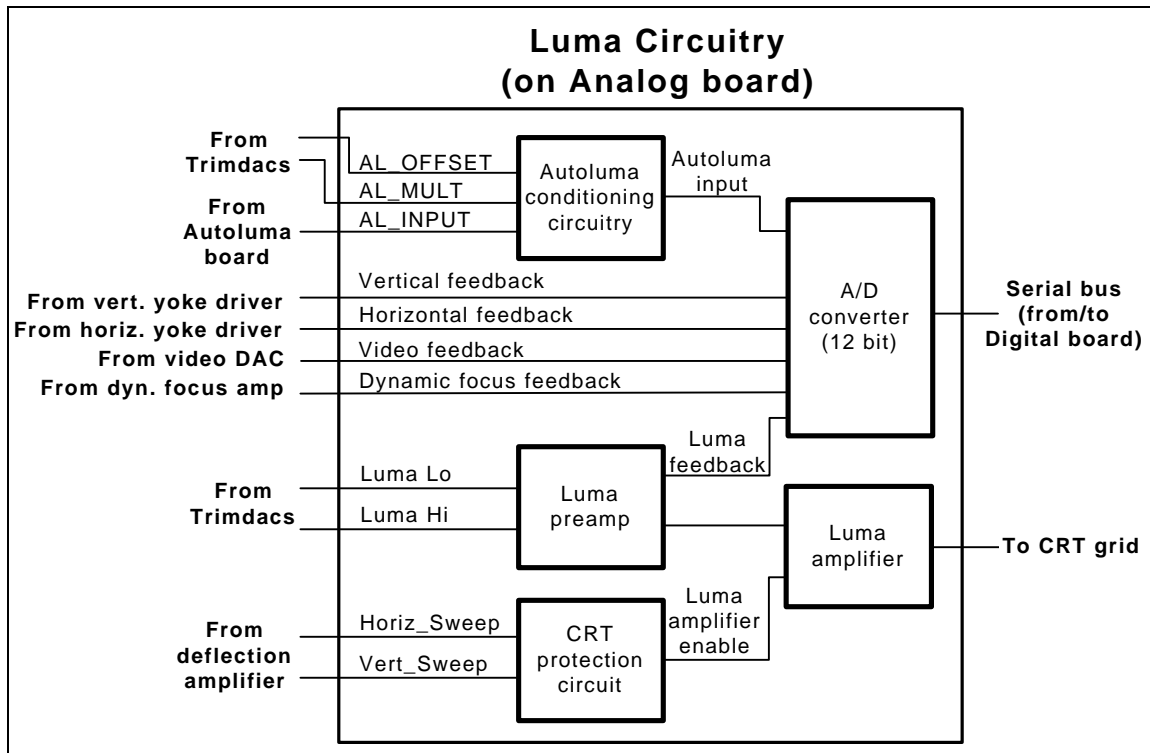


Figure 3-6. Autoluma circuitry on analog board

Slowscan Description and Imaging Sequence

This section provides a description of the ProPalette slow scan exposure process and the activities that the TMS320C26 DSP performs during an exposure.

The DSP has direct control over five D/A converters to control the CRT:

- X deflection- high speed 16 bit DAC
- Y deflection- high speed 16 bit DAC
- Video-high speed 16 bit DAC
- Cos^4 (controls video gain) - high speed 12 bit DAC
- Dynamic Focus - high speed 12 bit DAC

For a slow scan exposure, the three high speed DACs for deflection and video are updated for every pixel which is placed on the screen. The Cos^4 and Dynamic Focus DACs are updated at a slower rate.

The design goal is to be able to expose an image on 35mm film in less than 1 minute. The exposure process includes some startup time where a brightness auto-calibration is performed, and the exposure of three color planes; red, green, and blue. Between the exposure of each color, the color wheel must be moved. The exposure overhead of startup activities and filter wheel movement might consume about 15 seconds. The remaining time is used to expose each of the three primary components of an image.

The time to expose a line includes the time required to sweep the crt beam horizontally, displaying all of the pixels, and the time to retrace the crt beam to the beginning of the next line. A 'zig-zag' type exposure where the beam is swept left-to-right on the crt for one line and right-to-left for the next line has been rejected because the hysteresis of the deflection coils could skew the pixels between even lines and odd lines.

The mix of activities performed by the DSP, and dedicated hardware have been chosen to accommodate the major activities of:

- Generation of deflection values for the X and Y deflection dacs
- Generation of Cos^4 and Dynamic Focus values
- Generation of video DAC values at the pixel rate.

Grid for Deflection

A 4K image contains about 12 million pixels. For deflection, each grid point is represented by a 16 bit X DAC value and a 16 bit Y DAC value. These points are pre-computed by the V53 before the exposure begins. The grid points are generated from pre-computed data which compensates for all of the various sources of geometry non-linearity's on a CRT such as pin cushion, keystoneing, and non-orthogonality in the deflection coil. These points must be computed before the exposure of an image and the same grid data is sent for each of the three primary colors. As an aside, batches of images tend to be imaged at the same resolution so, in practice, grid points can be generated for an image and will most likely be reusable for subsequent images. The burden now falls on the DSP to read the grid points from the V53 and generate values for a given scan line.

Grid for Cosine⁴ and Dynamic Focus

Cos^4 and DyFoc DAC values are generated from their grid points in a similar fashion but at a slower rate.

Video DAC Data Generation

Pixel data is provided from the host computer as either RGB data or in a RLE format. If the data is sent as RLE data, the V53 must unpack the data and have it available to its DRAM as raw RGB pixels. RGB data is a byte per pixel per primary color. For each primary color, we have a byte value which indicates the density of that primary color for each pixel sitting in V53 memory.

This pixel data (8 bits) must be converted to video DAC data (16 bits). This is a non-linear conversion which must accommodate both the contrast of the CRT and the non-linearity of the film. There is a non-linear one-to-one correspondence between the pixel value and the video value. Throughout this documentation we make a distinction between pixel data and video data. Pixel data is a byte value which represents the brightness of a pixel. Video data is a 16 bit value to the video DAC to get that brightness on film.

Hardware is dedicated to do a pixel-to-video conversion at the required throughput rate. The hardware is a 256 word (16-bit) memory which is loaded with a video lookup table. The memory is addressed with the pixel value and the output is the video value. A V53 DMA channel is dedicated to sending the pixel data from its memory to the lookup table and the output of the lookup table is sent to the video DAC. To further reduce the DMA overhead, the V53 does a word transfer of two pixels at a time. This dedicated hardware has been integrated with the DSP so that it can control the synchronization of updating the deflection DACs and the video DAC.

For each primary color, the V53 must load the video look-up table with pixel-to-video values. This is a 256 word table. Before the exposure of a each line, the V53 initializes its video DMA channel with a pointer to the beginning of the pixel data in its DRAM for that line.

Exposure Summary

The V53 must have the following information available before an exposure begins:

- Grid point data for X and Y deflection
- Grid point data for Cos^4 and DyFocus
- A DRAM memory pipe filled with pixel data for the current primary color. While the exposure proceeds, the V53 must keep up with generating pixel data for subsequent lines. If the availability of pixel data starts to fall behind, then the exposure is slowly and gracefully throttled down so that the exposure rate matches the delivery rate of pixel data from the host.

There are two V53 DMA channels dedicated to supplying data to the DSP. One channel provides grid point data and the other supplies pixel data.

At the beginning of a color plane, the DSP fetches two lines of grid points from the V53 grid point DMA channel so it can compute grid points for the first 16 exposed lines. During subsequent 'retraces', grid point lines are read from the V53 DMA channel to get grid points for subsequent lines. During the scan of a line, the V53 pixel DMA channel is supplying pixel data. To keep grid point DMA transfers balanced grid points for the four DACs are fetched during a retrace.

DSP Hardware Architecture

The TMS320C26 is one of the TI TMS320 family of DSP processors. It's a 10 MIP processor with a 32 bit internal arithmetic data path and a 16 bit instruction size. Most instructions will execute in 1 tick (100 nsec) with some instructions requiring 2 ticks. Instructions can either be executed from internal or external program memory. Some instructions, when executed from external program memory, take 2 ticks because an external instruction fetch must be performed whereas when these same instructions are executed from internal memory they consume only one tick .

The TMS320C26 has 1.5K of internal memory. For our application, 512 words of internal memory are dedicated to program store and 1K words are available for data. The time critical portion of our exposure process is the calculation of grid points and generation of video data for a scan line. This DSP code is executed from internal instruction memory, during retrace, the DSP is fetching instructions from it's external memory (the external SRAM) and runs a bit slower than if it was running from internal program RAM.

In our configuration, the DSP runs with 0.5K of internal program memory and 2K of external program memory. Data memory includes 1K internal memory and 6K external memory. An external 8K word SRAM is available for program and data of which 2K is allocated for program store and 6K is available for external data

Another aspect of the DSP is that, when executing from internal memory with accesses exclusively to internal data memory, the external data bus is available for other autonomous activities.

Variable Resolution

A product requirement is that we are completely backward compatible with earlier models of the product line. The ProPalette 8000 must be able to expose a continuous and variable resolution from 256 to 4K. For exposing images which are not at 4K we add another tier of complexity;.

Because the grid for X and Y deflection is on a 16 pixel boundary and the grid for Cos^4 and Dynamic Focus are on a 64 pixel boundary, the V53 is set up to provide resolutions which are always a multiple of 64 pixels. The actual resolution is always promoted to the next multiple of 64 by the V53 and the V53 must pad any extra pixels with black.

Inner Loop Cycle Pauses

First, consider resolutions which are between 2048 and 4096. In order to keep the horizontal sweep frequency as constant as possible, pauses can be placed in the DSP cycle to slowly increase the cycle time as the resolution decreases. If the resolution is slightly less than 4K, a single NOP (1 tick) is added to the loop. The maximum variation in the sweep time will be about 12%.

The V53 has four classes of inner loop DSP programs which accommodate the various inner loop cycle pauses which are needed:

No pauses:	No NOP's
1 pause:	One NOP in each cycle
2 pauses:	Two NOP's in each cycle
3 or more pauses:	A 'repeat NOP' in each cycle with an appropriate repeat count

Resolution Doubling

Now consider lower resolutions; using a resolution of 2K as an example. At a 2K resolution, the grid data which is sent to the DSP is the same as for a 4K exposure. The DSP, however, will replicate the pixel data which is sent to the hardware. The DSP, in this case, is actually doing a 4K horizontal exposure but every pixel is sent twice.

The DSP has the capability to indicate which of the two pixels (in the low byte or high byte latches) are sent through the LUT to the video DAC. It also determines when a DMA request is made to the V53 for another pair of pixels.

For a 4K image, in each cycle, the order of pixel-to-video translation would be:

Low pixel
High pixel, generate DMA request for next pair
Low pixel
High pixel, generate DMA request for next pair
etc.

For a 2K image, the order of translation is:

Low pixel
 Low pixel
 High pixel
 High pixel, DMA request
 Low pixel
 Low pixel
 High pixel
 High pixel, DMA request
 etc.

There is no additional computational or DMA overhead associated with pixel doubling. The only difference is the specific DSP inner loop program which is loaded. We need 5 classes programs to deal with pixel doubling.

<u>Doubling</u>	<u>Times for Each Pixel</u>	<u>Comments</u>
0	1	No doubling for 2K to 4K images
1	2	1K to 2K images
2	4	512 to 1K
3	8	256 to 512
4	16	256 pixel images

Inner Loop Variations

The V53 maintains 20 different DSP programs to accommodate all of the variations to accommodate different resolutions. There is a matrix of 4 pauses and 5 resolution doublings. Each DSP inner loop program is less than 1K byte. Total storage in the V53 for all 20 variants is less than 15K bytes.

Vertical pixel doubling must be accommodated by the V53. It will retransmit the same line of pixel data for multiple lines. The fact that the vertical resolution is doubled must be reflected in the grid values which are initially computed for the image.

Flash Description

The Flash devices in ProPalette are programmable, non-volatile memories which are used, primarily, to store the control code and gridpoint data for the ProPalette system. Other programs and data can be placed in the system such as diagnostics and control information.

Flash Data Organization

The flash contains data blocks of various sizes. Each data block is preceded by a flash header. The header contains information on what is in the data block and how large the data block is.

The flash header structure is defined:

flash_data_type It lists all of the valid data block types which can reside in flash. Examples include CNTRL_CODE, DIAGNOSTICS and GRIDPOINTS.

data_length Length of the data block (excluding the header) in bytes.

software_version Version of the program which put this data block into flash. This is not necessarily the version of the data or program in the block.

startup_segment The segment address of where this data goes. For data blocks which are raw data, as opposed to programs, this value is 0. For data blocks which are programs, this is where the programmed is moved when it gets executed.

hdr_name A description of the data block type.

data_name Description of the data itself and is provided by the program which actually puts the program in flash. For an executable, this is typically the name of the program. For instance, for the CNTRL_CODE flash_data_type, the hdr_name is 'Control Code' and the data_name would be something like 'kacntrl'.

There is no fixed order of data blocks in flash. They are programmed into flash as they are received. Data blocks cannot be duplicated; there's only one copy of a given data type in flash at any time. If a data block is to be programmed and an older copy already exists, then the older copy is effectively overwritten.

Programs for Reading and Writing the Flash

Two low level programs are available to read and write the flash. Other programs can include code to manipulate the contents of flash. For instance, kacntrl can put GridPoint data into flash. The format of the GridPoint data is out of the domain of the general flash programs and this data is only programmed by kacntrl.

The two low level general purpose programs which are available are the Flash Dispatcher and the Flash Manager.

The Flash Dispatcher resides in EPROM and is able to read a directory and start any of the programs which reside in flash.

The Flash Manager is a program which may reside in flash and be can be started by the Flash Dispatcher. It can add data blocks, remove data blocks, and erase the entire flash. Normally, production units do not have Flash Manager burned in flash. If Flash Manager is needed, it can be loaded and executed from DRAM.

When the system is started from a hard reset, startup code examines the state of the startup switches on J3. The two startup switches, J3-6 and J3-8 provide four states:

State	J3-6	J3-8
ROM Monitor	gnd	gnd
Debugger	open	gnd
Control Code (default)	open	open
Expansion Code	gnd	open

The ROM Monitor is started, using the first serial port as a console.

The Debugger is started, using the second serial port for talking to the remote debugger which is running on the host.

When the switches are set to Control Code or Expansion Code, the EPROM version of the Flash Dispatcher gets control.

If the switches are set for Control Code, the Flash Dispatcher moves the CNTRL_CODE data block to DRAM and starts executing the code.

If the switches are set for Expansion Code, the EXPANSION_SWITCH data type is read from flash. The data block in the EXPANSION_SWITH data type contains two pieces of data; a program to run and a flag indicating whether this program should be directly executed or whether it should be run using the debugger.

Autoluma Description

This section describes the implementation of the autoluma process in the ProPalette firmware and the host side tools available to perform autoluma tests.

Autoluma is implemented on the ProPalette as a distinct back end mode.

When the ProPalette is placed into the autoluma mode, it will wait for a queue message which contains autoluma parameters which describe all of the variables associated with autoluma. It also contains a single entry for the autoluma result. The ProPalette, on receipt of the request will do a single frame autoluma and make the result available.

The parameters which can be set in the autoluma_parameters are listed in Table 3-3.

<i>Table 3-3. Autoluma Parameters</i>	
<i>Parameter</i>	<i>Description</i>
horizontal resolution	fixed at 512, should not be modified
vertical resolution	limited choices, 64 or 32
adc_offset	a/d converter trimdac offset, 0-255
adc_multiple	a/d converter trimdac multiplier, 0-255
hi_luminant_dac	hi luminant trimdac setting, 0-255
lo_luminant_dac	lo luminant trimdac setting, 0-255
video_level	dac-16 value for luminant, a single video; dac level is used during the entire frame
filter_position	R, G, B, or clear
frst_alum_line	first scan line for autoluma samples
last_alum_line	last scan line for autoluma samples
frst_alum_block	first block for autoluma samples
last_alum_block	last block for autoluma samples

Autoluma Scan Description

To perform an autoluma, a slow scan occurs with a fixed video level for all pixels. A programmable rectangular area within the frame can be set where actual autoluma a/d conversion take place. The size and location of this area is determined by the the parameters in the message. A block is the equivalent of 4 pixels at a resolution of 512. Therefore, at a conceptual level, the horizontal resolution of an autoluma frame can be thought of as 128.

A large number of samples are performed and accumulated.. When the autoluma is completed, the accumulated autoluma value is multiplied by 16 and then divided by the number of samples which were taken. This provides a single autoluma result which is normalized to a 16 bit unsigned value. This is the value which is returned.

Firmware Description

Downloading New Firmware

New firmware can be downloaded to the ProPalette for storage in flash. The new copy replaces the copy in the unit. The procedure for downloading new firmware is described on page 113.

General Description

New firmware is sent to the Propalette in the Intel HEX format from the host computer. After all of the hex data is transmitted, the firmware is burnt into the Flash. This process takes about 40 seconds and the progress is displayed on the LCD. After the new firmware is in flash, the ProPalette is restarted so that the new firmware is running.

Camera Back Interface

The ProPalette has a flexible camera back interface including a 400 mA shutter driver, an X-connector input (for shutter control), a film door switch input, a film perforation sensor input, a 500 mA bi-directional film motor driver, 6 DX code inputs for sensing ISO film speed, +5V @ 2A and +24V @ 1.2A power outputs.

Camera backs connect to the ProPalette through a 20-pin edge connector suitable for a double sided, 0.049" thick PC board with 10 signal conductors per side. The PC board traces must be 0.040" +/- 0.005" wide on 0.100" +/- 0.005" centers.

The connector pinout is described in Figure 3-7 and Table 3-4. All 'inputs' are inputs from the film recorder's perspective (outputs from the camera back). Control signal timing may be individually adapted to the various camera back types when their interface requirements are defined.

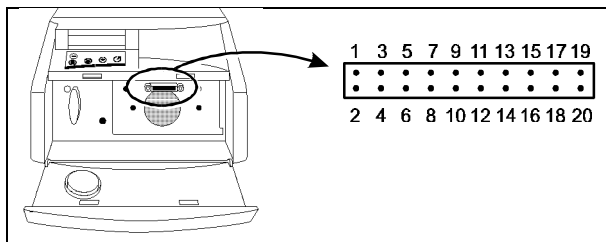


Figure 3-7. Camera connector pin numbers

Table 3-4. Camera Connector Signal Descriptions

<i>Signal Name</i>	<i>Pin No. (Figure 3-7)</i>	<i>Description</i>
BLADE_MAG	1	Shutter magnet, active low -- driven low to hold shutter open, released (floated) to close shutter. Vlow = 0.6V max @ 300mA
BLADE_MOT	3	Shutter control signal, active low -- driven low then high in conjunction with X-CON transitions to open shutter. Vlow = 0.6V max Vhigh = CBVCC - 0.2V min @ 300mA
CBVCC	5	+5V for camera power. Protected against shorts with internal 2A fuse.
GND	17	Return for all +5V camera circuitry.
CBPWR	14	+24V for camera power. Protected against shorts with internal 2A fuse
+24V_RET	16	Return for all +24V camera circuitry.
35BACK_SW	7	Film door switch input. Pulled high to CBVCC with 10K ohms.
X-CON	9	X-connector input for shutter timing. Used with 35mm camera. Pulled high to CBVCC with 10K.
PERF_LED(A)	11	Perforation LED anode. Used with 35mm camera.
PERF_LED(K)	15	Perforation LED cathode. Used with 35mm camera.
/35PERF_SENSE	13	Perforation sensor voltage. Used with 35mm camera.
FILM_WIND(-)	19	Film wind/rewind motor drive signal. First half of 500mA full H-bridge driver Vhigh = 5.5V - 6.0V Vlow = 0.6V - 1.4V @ 500mA
FILM_WIND(+)	20	Film wind/rewind motor drive signal. Second half full H-bridge driver.
DXCODE1	2	DX code bit 1. Used only to sense camera back +5V power is present (+5V fuse test). Labeled DXCODE1 for historical reasons.
DXCODE2	4	DX code bit 2. First of 5 bits used for sensing of ISO film speed and camera back type (see note below). Pulled low to GND with 20K ohms.
DXCODE3	6	Code bit 3. Pulled low to GND with 20K ohms.
DXCODE4	8	Code bit 4. Pulled low to GND with 20K ohms.
DXCODE5	10	Code bit 5. Pulled low to GND with 20K ohms.

<i>Table 3-4. Camera Connector Signal Descriptions</i>		
<i>Signal Name</i>	<i>Pin No. (Figure 3-7)</i>	<i>Description</i>
DXCODE6	12	Code bit 6. Pulled low to GND with 20K ohms.
Not used	18	

The ANSI specification for 135-Size Film Magazines and Film (35mm) identifies 25 five-bit DX codes for sensing ISO film speed. Thirty-two total combinations are possible with five bits, leaving seven combinations unused. Polaroid uses these 'open' DX code sequences to identify various camera back types for use with ProPalette. Detection of any valid DX code, or no DX code, indicates a 35mm camera is attached. Other camera types are identified in Table 3-5.

<i>Table 3-5. DX Sequence</i>					
<i>DX6</i>	<i>DX5</i>	<i>DX4</i>	<i>DX3</i>	<i>DX2</i>	<i>Camera Type</i>
0	0	0	0	1	Pack Film
0	0	0	1	0	AutoFilm
0	0	0	1	1	4x5
0	0	1	0	0	6x7
0	0	1	0	1	Not used (future)
0	0	1	1	0	Not used (future)
0	0	1	1	1	Generic, for future camera types. Camera type to be identified via firmware only; no specific hardware ID.

Keypad/LCD Interface

The ProPalette film printer features a 2 line x 20 character backlit LCD and accompanying 4 key input panel. Each character is composed of a 5x7 matrix of pixels. The display supports direct printing of ASCII strings via an internal character generator. New characters, ie. not part of ASCII set, may be displayed by overwriting the default character codes in the display RAM. Any combination of 5x7 pixels may be defined.

A 4 key input panel sits directly underneath the LCD. The keys are labeled, left to right, UP - DN - SEL - ESC. Various film printer set up functions are accessible through the keypad. These functions are divided into 6 categories (menus); setup menus are displayed for 5 seconds after the ESC button is pressed.

LCD Menus

The ProPalette menu system is outlined in Table 3-6.

Table 3-6. ProPalette LCD Menus			
Menu	Available Choices	Menu	Available Choices
Camera Control Menu	Rewind Film Advance Film	Run Diagnostics	Expose Int Image Run Startup Diags Monitor Mode
Select SCSI ID: curr_id#	1 2 3 4 5 6 7	Select Language	English German French Spanish
Camera Configuration	Leave a Leader Leave no Leader		
Select Film Type	Presentation Chrome HC Polachrome		

Exiting from Menus

The display automatically reverts back to the current status message 5 seconds after the last key press.

Startup Messages

At startup (power turned on, film printer hard reset) the following message is displayed:

Polaroid ProPalette 8000
Version XXX

NOTE: { .. } indicates vertically scrolled message

Status Messages

Status messages include:

Ready/XX Frames Exposed/XX Frames Remain/{Film Type}/Press  ESC to Setup

Loading Film.../please wait

Rewinding Film.../please wait

Exposing Red Line XXX

Exposing Green Line XXX

Exposing Blue Line XXX

Film Tables

Film type selection via the keypad provides access to any Flash resident film tables. If a film is selected via the keypad, it overrides any attempted film table downloads from the host. If the host attempts to download a different film table, a "Film wrong for camera" error is generated.

Pacing Commands

During the exposure of an image, the CRT beam must move in a smooth and consistent manner. If the ProPalette can print faster than pixel data is being received, there will be pauses in the exposure while the printer waits for additional data. An artifact appears on the film as a result; appearing as a horizontal line.

The host side driver, if it doesn't supply pixel data fast enough, must tell the film printer at what speed to expose each line. This line-to-line exposure time must be at least as long as the average line delivery time.

Adjustments can be made to this time during the exposure as long as the adjustments occur in small increments. An abrupt change in the line-to-line exposure can create an artifact on film.

Two pacing commands, PaceNow and PaceQueue, are available to control the exposure speed. These two commands are provided to give the host driver designer more versatility in the design of the driver.

The PaceNow command takes effect as soon as it is received by the ProPalette.

The PaceQueue command will be queued by the film printer and will take affect in the order that it's processed. For instance, suppose that there are 30 lines of pixel data already queued in the filmprinter. If a PaceQueue command is sent, the exposure speed will be adjusted after the current queued lines are exposed. Lines sent subsequent to the PaceQueue command will be exposed at the new rate.

4. Troubleshooting and Diagnostics

Recommended Diagnostic Sequence

Several methods can be used for performing diagnostics on the ProPalette. An initial self test is performed when the unit is first turned on, the reset button is pressed or “Run Startup Diagnostics” is selected from the LCD/Keypad. A complete set of diagnostics, in addition to system alignment, can be performed by the System Test Stand (refer to Chapter 5).

Board-level tests can be performed if the correct software is available and installed on a host computer. These board level tests are not necessary because the same functionality is performed by either the Start Up diagnostics or the System Test Stand. The test programs are:

<u>Program</u>	<u>Tested Component</u>
FPDIAG.EXE*	Digital board
MEDTEST.HEX*	Analog board
DIGIOTST.HEX*	Filter wheel, Camera, LCD
ProComm	Communication software

***Provided on support software disk P/N 13699.**

Inspection and Cleaning

After completing diagnosis and repair, inspect the ProPalette unit for damage or other physical indications of problems. As a final step, clean the CRT face and the camera lens according to instructions on page 30.

Firmware Upgrade

Purpose

Perform the firmware upgrade described in this section on all ProPalette 8000 units to assure they have the latest revision of firmware.

Note

You can also use the ProPalette Test Stand to upgrade firmware, as described on page 113.

Obtaining the Latest Firmware

Polaroid's FTP site on the Internet has two files that contain the latest firmware update.

<http://ftp.polaroid.com/pub/imaging/output/cfrecord/prop8000>

Currently, the easiest way to get to the FTP site is from the Polaroid homepage. Follow these steps for easy access to Polaroid's FTP site, a storage area for the very latest ProPalette 8000 information including film tables, software upgrades, and firmware upgrades:

1. Display Polaroid's homepage at **www.polaroid.com**
2. From the homepage, navigate to the Products page.
3. On the Products page, press the Color Film Recorders button.
4. On the Color Film Recorders page, press the Get Info button under ProPalette 8000.
5. At the bottom of the ProPalette 8000 Information page, press New Film Tables.

For Macintosh, access file PRO8Vnnn.SEA. For PC/Windows, access file PRO8Vnnn.EXE. Both files are self-extracting. Double-click to extract the necessary files and read the README.TXT file for important information before beginning.

Required Tools and Equipment

- PC with :
 - 386 CPU
 - MS-DOS ver 6.22
 - 4 MB RAM
- FWLOAD.EXE executable program
- KACNTRL.HEX latest version of the firmware file
- Parallel cable

Procedure*Note*

The assumed starting point is a working printer with firmware already burned into flash memory.

1. Connect a parallel cable between the PC (LPT of your choosing) and the film printer.
2. Power on the film printer and wait for the “Ready” message to appear on the LCD.
3. From the sub-directory that contains the extracted files, run FWLOAD.EXE <hexfilename> <portnum> where hexfilename is the path and name of the control code hexfile, eg. KACNTRL.HEX and portnum is the LPT port number connected to the printer. The default parallel port is LPT1; if the printer is connected to LPT1, there is no need to specify portnum. If no hexfilename is specified, FWLOAD attempts to load 'KACNTRL.HEX' from the current directory.
4. Wait until the program reports it has finished and the film printer resets itself. (The LCD displays "Getting data...", "Programming flash..." and "Resetting..." during the download/burn process.)
5. Reset the ProPalette to complete the firmware upgrade.

The new firmware version appears on the LCD panel, indicating that the upgrade has been successful.

ProPalette Startup Diagnostics and Tests

ProPalette automatically runs the following diagnostics when it is powered up, reset or when Run Startup Diagnostics is selected from the ProPalette LCD menus:

Filter wheel stepper motor driver. Tests filter wheel stepper motor driver on digital board by moving the filter wheel to home position, then indexing it.

DRAM test. Tests heap and expanded memory. Tests all expanded memory or a 2-megabyte block of expanded memory. Returns the amount of expanded memory found.

Flash memory test. Tests flash memory by checking for corrupted virtual flash directories. Returns flash memory statistics.

Horizontal channel. Checks for correct horizontal channel output when horizontal DAC16 input, horizontal size trimdac and horizontal center input on the analog board are individually exercised. Refer to Figure 4-1.

Vertical channel. Checks for correct vertical channel output when vertical DAC16 input, vertical size trimdac and vertical center input on the analog board are individually exercised. Refer to Figure 4-1.

Video channel. Checks for correct video channel output when the video DAC16 input and Cos⁴ dac on the analog board are exercised. Refer to Figure 4-1.

Luma trimdac. Checks for correct output from each of the two analog board luma trimdacs (hi_luma and lo_luma) when they are individually exercised with the other luma trimdac zeroed. Refer to Figure 4-1.

Dynamic focus. Checks for correct dynamic focus dac output on the analog board when the dac is exercised. Refer to Figure 4-1.

Note

The analog board tests above (horizontal channel through dynamic focus) are static tests only and may not detect analog-board problems that occur only under dynamic conditions. If this test is successful and you still suspect that the analog board is faulty, replace the analog board.

Any problems detected by these diagnostics are reported on the ProPalette LCD display during the tests. (The most recent error can be redisplayed by selecting Show Last Error from the ProPalette LCD menus.)

For a list of possible messages, along with possible causes and corrective actions, see page 87.

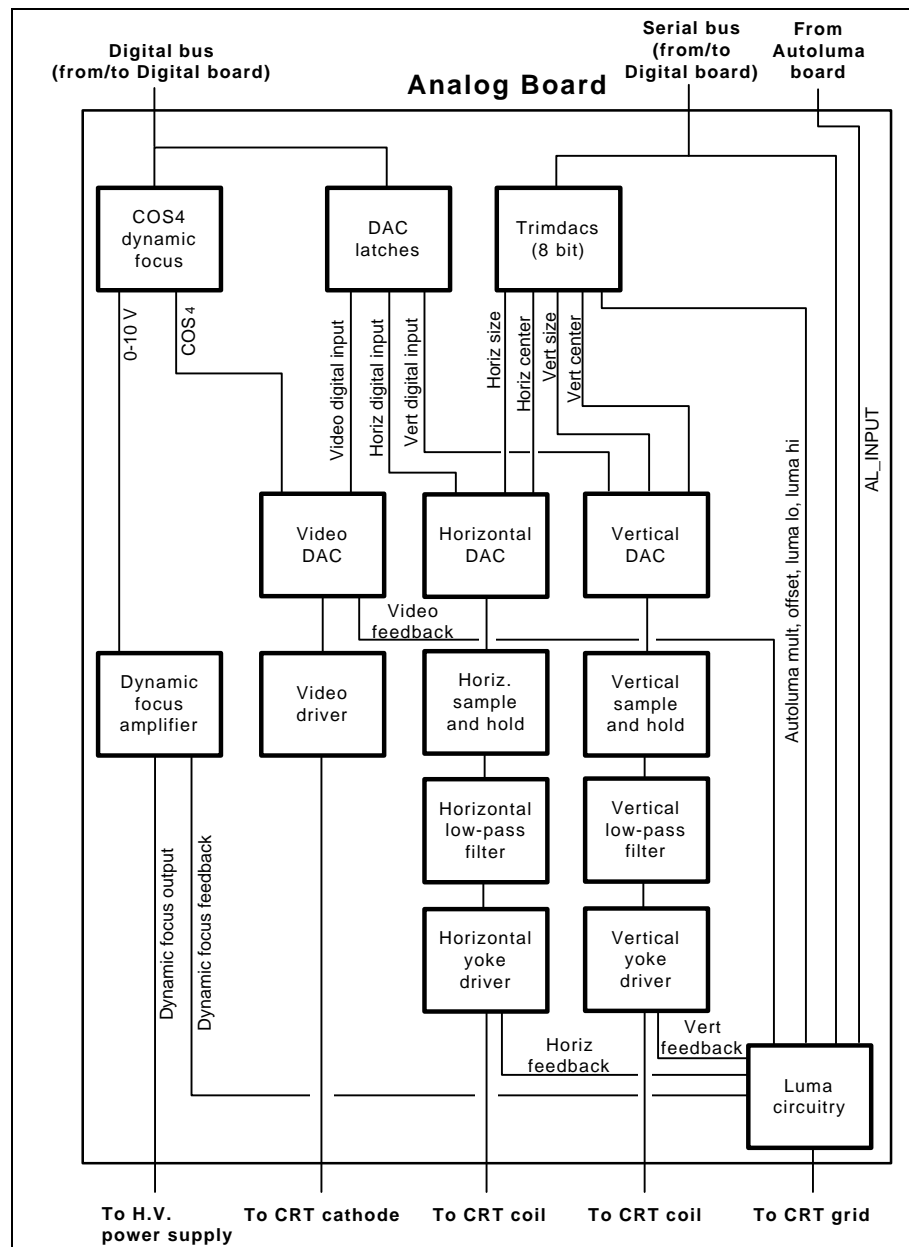


Figure 4-1. Analog Board Block Diagram

Test Image Exposure Sequence

To verify system operation, ProPalette cycles through the sequence for printing a test grid when Test Image is selected from the LCD menus. (This sequence does not operate the camera.)

By removing the camera and looking through the camera mount, a technician or operator can verify operation of the CRT (a grid appears on the CRT face) and the filter wheel (normal rotation sequence).

Monitor Mode

The monitor mode selection on the ProPalette LCD menus passes control of ProPalette to its EEPROM. This item is intended only for low-level tests during manufacturing and has no use in service or operation.

If monitor mode is accidentally selected, press the Reset button on the rear of the ProPalette to restart the system and return to normal mode.

Error Message Redisplay

Error messages produced by startup diagnostics are displayed on the ProPalette LCD panel for a few seconds. To redisplay the most recent error, select Show Last Error from the ProPalette LCD menus.

Serial Communication Cable

Purpose

The serial cable for communicating with the ProPalette 8000 consists of the following parts with the adapter wiring diagram.

Required Equipment

Cable, 6 conductor	L-COM P/N TDC057-14UL
Modular Adapter, DB9 to RJ11	L-COM P/N RA096F

Wiring Diagram

DB9 PIN #	WIRE COLOR	RJ11 PIN #
1	BLUE	1
2	RED	4
3	YELLOW	2
4	N.C	
5	WHITE	6
6	N.C.	
7	BLACK	5
8	GREEN	3
9	N.C.	

Digital Board Diagnostics (FPDIAG) via Host Computer

Purpose

The diagnostic program FPDIAG performs all the ProPalette internal diagnostics described in the previous section. In addition, it performs following tests to evaluate the Digital Board completely:

V53-DSP SRAM. Tests V53-DSP SRAM on the digital board by loading the biotst.dat DSP program into DSP memory. This program reads data that the V53 sends to the DSP data port and stores it in its data memory. The DSP code is loaded and fired up. Then a number of words are sent to the DSP data port. The DSP is turned off and the same set of words are verified in the DSP's memory.

35mm camera interface circuit. Tests the 35mm camera interface circuit on the Digital Board by executing commands.

LCD and keypad. Tests LCD/Keypad module interface on the digital board by turning all LCD segments (5x7 matrix) on and then changing them to an (*) to verify LCD operation. Also tests the keypad by waiting for the operator to press each key when the full matrix is illuminated.

Required Tools and Equipment

- PC with :
 - 386 CPU
 - MS-DOS ver 6.22
 - 4 MB RAM
- FPDIAG.EXE program
- TEST.DAT configuration file required by FPDIAG.EXE
- Serial cable on COM1
- 35mm film

Test Procedure

1. Turn the ProPalette power switch to off.
2. Load a roll of film into the 35mm ProPalette camera.
3. Connect the PC serial port to the ProPalette serial connector (Figure 4-2).
4. Turn on the PC.
5. Turn the ProPalette power switch to on and wait until the LCD panel displays the “Ready” message.
6. On the PC, log into the drive and directory containing the files FPDIAG.EXE and TEST.DAT. FPDIAG.EXE is the executable file and TEST.DAT contains the test parameters.
7. Type **fpdiag -filename=<string>** where <string> is the name to be given to the report created by fpdiag.
8. To start the test, press ENTER.

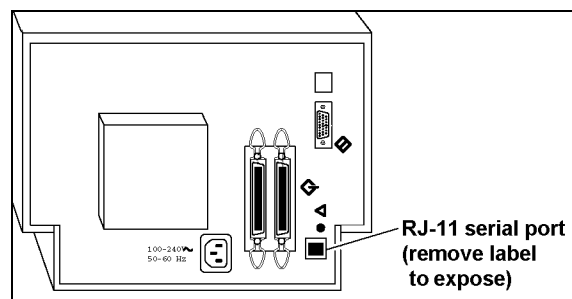


Figure 4-2. ProPalette serial connector

9. Observe the ProPalette LCD panel. The only prompt to the operator is to watch the LCD display for full matrix illumination and then press the keypad and verify the change in display characters to (*).

Note

Failure to press the keypad will result in a time-out error and the LCD/Keypad will be reported as defective.

10. When the message “Testing Complete, fpdiag DONE!” appears on the PC monitor, use a text editor to review the file named in step 7.

If necessary, refer to Diagnostic (FPDIAG) Error Message Tables on page 87 to troubleshoot any error messages in the file.

Configuring a PC to Upload a Hex File

Purpose

Several low level board tests can be performed by establishing serial communication to the ProPalette using the communication program ProComm (PCPLUS), uploading a hex file and executing that file.

Required Tools and Equipment

- PC with :
 - 386 CPU
 - MS-DOS ver 6.22
 - 4 MB RAM
- HEX file
- Serial cable on COM1
- 35mm film if required

Procedure

1. Set up the environment on the PC for ProComm by including the PCPLUS sub-directory in the PATH statement and add the following line to the AUTOEXEC.BAT file:

`PCPLUS=C:\PCPLUS`
2. Turn on power to the ProPalette and let the self-test diagnostics run.
3. Set ProPalette into the ROM Monitor mode by selecting DIAGNOSTICS/GOTO MONITOR MODE from the LCD/Keypad.

4. From the directory containing the HEX file, execute ProComm by typing **pcplus** and pressing ENTER <cr>. Hit any key to go through the Welcome screen to the Terminal screen shown in Figure 4-3.
5. From the Terminal screen send a Break <alt B> to the ProPallette.
6. Press the <cr> key several times until the Monitor login appears (Figure 4-4).

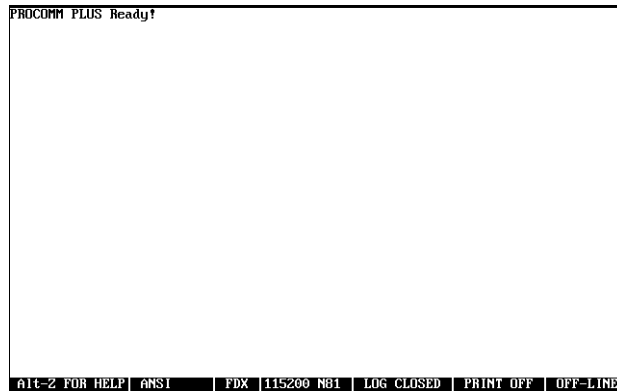


Figure 4-3. Terminal screen

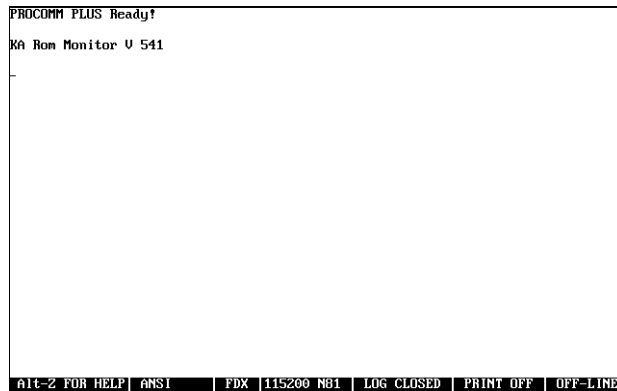


Figure 4-4. Monitor login screen

7. Type **hl** and press the <cr> key.

The message “Ready to receive hex file” appears on the monitor (Figure 4-5).

8. Press the PAGE UP key to upload the file.
9. When a dialog window opens for a protocol request (Figure 4-6), type **r**.
10. When the next dialogue window requests the name of the file (Figure 4-7), type the full file name (e.g., **digitst.hex**) and press <cr>.

The status line at the bottom of the screen indicates that the upload is in progress.
(The upload may require a few minutes.)

```

PROCOMM PLUS Ready!
KA Rom Monitor U 541
?
-hl
Ready to receive hex file...

Alt-2 FOR HELP | ANSI | FDx | 115200 N81 | LOG CLOSED | PRINT OFF | OFF-LINE
    
```

Figure 4-5. Response to hl command

```

Upload Protocols |
X) XMODEM          A) ASCII
Z) ZMODEM          R) RAW ASCII
Y) YMODEM (Batch)  T) TELINK
G) YMODEM-G (Batch) M) MODEM7
O) 1K-XMODEM       W) WXMODEM
E) 1K-XMODEM-G     I) IMODEM
C) COMPUERVE B+    L) TEXT 11
K) KERMIT           Z) TEXT 21
S) SEALINK         3) TEXT 31

Your Selection: (press ENTER for RAW ASCII)
    
```

Figure 4-6. Protocol request dialog window

```

RAW ASCII UPLOAD |
Please enter filename: digitst.hex
    
```

Figure 4-7. File name request dialog window

11. Wait for the ROM Monitor to indicate that the upload is complete (Figure 4-8).
12. To start the program, type **g 0** and press <cr>. (The command requires a **zero**, not the letter “O,” as shown in Figure 4-9.)
13. Follow the instruction on the screen to perform the diagnostic test.
14. When testing is completed; exit the program back to the Monitor prompt (-), press <alt X> and **Y** to exit ProComm (see Figure 4-10).
15. Reset the ProPalette by either shutting down the power or pressing the reset button.

```
PROCOMM PLUS Ready!  
KA Rom Monitor U 541  
?  
-hl  
Ready to receive hex file...  
Start Address 0100:0000  
OK  
-  
  
Alt-Z FOR HELP | ANSI | FDx | 115200 N81 | LOG CLOSED | PRINT OFF | OFF-LINE
```

Figure 4-8. Screen indicating upload complete

```
PROCOMM PLUS Ready!  
KA Rom Monitor U 541  
?  
-hl  
Ready to receive hex file...  
Start Address 0100:0000  
OK  
-g 0  
  
Alt-Z FOR HELP | ANSI | FDx | 115200 N81 | LOG CLOSED | PRINT OFF | OFF-LINE
```

Figure 4-9. Command g 0

```
EXIT TO DOS? (Y/N) Yes
```

Figure 4-10. Exit to DOS confirmation

Digital Board Interface Test

Purpose

A more thorough test can be performed on the interface functions that are driven by the Digital board. These include Filter Wheel, Camera and LCD/Keypad. These tests are performed by loading a hex file into the ProPalette using ProComm and running the tests through the ROM Monitor.

Required Tools and Equipment

In addition to the Upload a HEX File procedure, the diagnostic file DIGIOTST.HEX is required.

Test Procedure

1. Upload the diagnostic file DIGIOTST.HEX according to “Configuring a PC to Upload a Hex File” on page 74.

The main menu options appear (Figure 4-11).

2. Type **1** to test the Filter Wheel. Follow the on screen instructions, then type **q** to return to the main menu.
3. Type **2** to test the Camera Back from the sub-menu (Figure 4-12). Follow the on screen instructions. When testing is complete, type **q** to return to the main menu.

```

digiotest ... tests the digital board io
Version 559
Compiled on Sep 16 1996

Camera type is set to 35mm

Enter '1' for filter wheel test
      '2' for camera back test
      '3' for lcd test
      '4' to quit
    
```

Figure 4-11. Main Menu options

```

--- camera back test ---

Enter 'l' to load, 'r' to rewind, 'e' to expose, 'o' to open shutter,
      'c' to close shutter, 'd' for DX code, 's' to set exposure time,
      't' to run cycle test, or 'q' to quit:
    
```

Figure 4-12. Sub-menu for testing the camera back

4. Type **3** to test the LCD display from the sub-menu (Figure 4-13). Follow the on screen instructions, then type **q** to return to the main menu when testing is complete.
5. Type **4** to exit the testing and return to the ROM Monitor mode.

Note

Be sure to reset the ProPalette before performing any additional testing.

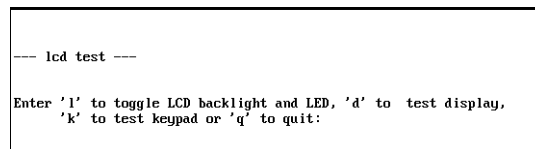


Figure 4-13. Sub-menu for testing the LCD display

Analog Board Voltage Test

Purpose

This procedure verifies correct voltages on the ProPalette Analog board.

WARNING

This test requires that the outer housing of the ProPalette is removed for access to the specified test points while the equipment has the power turned ON.

Required Tools and Equipment

Multimeter

Test Procedure

With the ProPalette power on, use a multimeter to check the following voltages on the analog board (Figure 4-14). If any voltage is out of specification, replace the low-voltage power supply.

<i>Test Location (Figure 4-14)</i>	<i>Reference Location</i>	<i>Voltage Specification</i>
TP44 (filament voltage)	TP41	12.7 \pm 0.4 (12.3 to 13.1)
TP17 (DAC_VREF)	TP4	5.00 \pm 0.03 (4.97 to 5.03)
TP18 (DAC_VREFV)	TP4	5.00 \pm 0.03 (4.97 to 5.03)
TP27 (VDD_C)	TP4	12.0 \pm 0.4 (11.6 to 12.4)
TP46 (VSS_C)	TP44	-12.0 \pm 0.6 (-11.4 to -12.6)

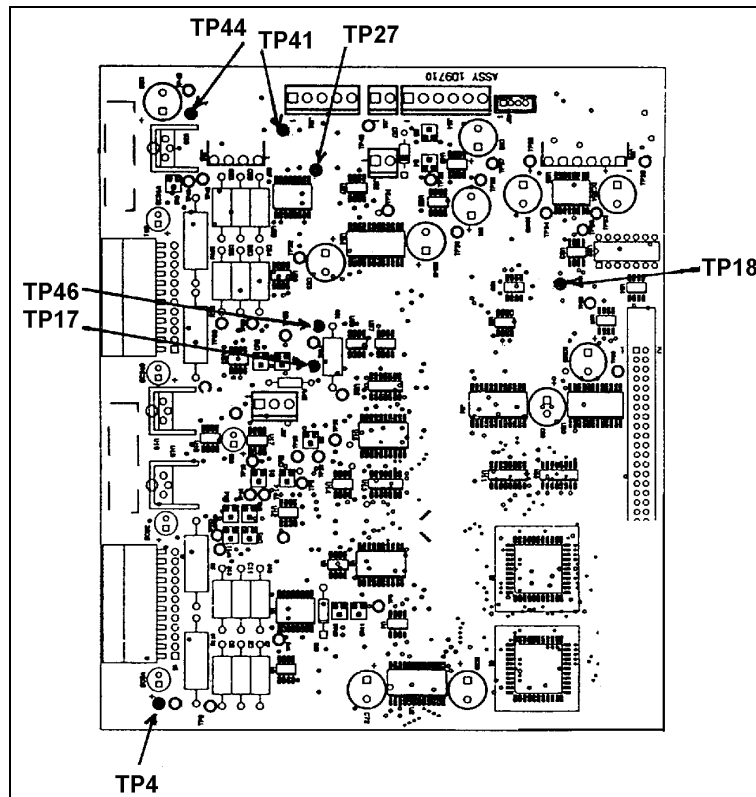


Figure 4-14. Analog Board voltage test points

Analog Board Functional Test via Host Computer

Purpose

The ProPalette Analog board can be exercised with static tests to verify it's functionality. MEDTEST.HEX is a program that is initially downloaded via the serial port, and is then run from the ROM Monitor mode. There are six tests defined in it's main menu.

Required Tools and Equipment

In addition to the Upload a HEX File procedure, the diagnostic file MEDTST.HEX is required. A -0.8 volt dc source for autoluma test is also needed.

Test Procedure

1. Upload the diagnostic file MEDTST.HEX according to "Configuring a PC to Upload a Hex File" on page 74.

The main menu options appear (Figure 4-15).

2. Enter the command for the desired test from the list below. Refer to the following sections for more detailed information about each test.

<u>Test</u>	<u>Command</u>
Horizontal channel	ht
Video channel	vdt
Autoluma	at
Vertical channel	vt
Luma trimdac	lt
Dynamic focus	df

```

ProPalette 8000 Analog Board Tester, Version 1.03, 1/2/96

--- The following commands are available:
* ht      test horizontal channel
* vt      test vertical channel
* vdt     test video channel
* lt      test luma trimdacs
* at      test autoluma circuitry
* df      test dynamic focus circuitry

* ?      print this help list
* q      return to the rom monitor
*

Alt-Z FOR HELP|ANSI | FDx |115200 N81 | LOG CLOSED | PRINT OFF | OFF-LINE

```

Figure 4-15. MEDTST.HEX Main Menu options

Horizontal channel test (ht)

This test consists of three sub-tests

1. Horizontal DAC16 test
2. Horizontal size trimdac test
3. Horizontal center trimdac test

The sub-tests are run sequentially, the results are printed to the screen and the main menu is displayed.

Vertical channel test (vt)

This test consists of three subtests

1. Vertical DAC16 test
2. Vertical size trimdac test
3. Vertical center trimdac test

The sub-tests are run sequentially, the results are printed to the screen and the main menu is displayed.

Video channel test (vdt)

This test consists of two subtests

1. Video DAC16 test
2. COS^4 dac test

The sub-tests are run sequentially, the results are printed to the screen and the main menu is displayed.

Luma trimdac test (lt)

There are two luma trimdacs, hi_luma and lo_luma. The output of these two trimdacs is added to create the input to the luma amplifier. The tests are run sequentially, the results are printed to the screen and the main menu is displayed.

Autoluma test (at)

The autoluma test consists of two parts, testing the autoluma offset , and testing the autoluma multiplier. This test requires a -0.800 Vdc input, applied to TP 16 or J35 pin 2 referenced to TP 41. The tests are run sequentially, the results are printed to the screen and the main menu is displayed.

Note

Failure to use the -0.800 Vdc bias voltage will result in the false reporting of a Luma test error.

Dynamic focus test (df)

The dynamic focus dac is exercised. The output is measured by the on board A/D. The results are printed to the screen and the main menu is displayed.

Analog Board Functional Test Troubleshooting

The reporting of any valid error requires the replacement of the Analog board

Parallel Port Hardware Test

The functionality of the parallel port is validated by upgrading the system firmware.

SCSI Interface Hardware Test

The functionality of the SCSI interface is validated by operating the equipment and printing images.

Image Evaluation

Purpose

It is necessary to evaluate the effectiveness of the ProPalette repair by exposing test images on the functioning unit from a PC running Windows 95, Microsoft Power Point and RasterPlus95. This procedure also validates the functionality of the SCSI interface.

Note

The assumed starting point is a ProPalette that has passed all functional tests and alignments

Required Tools and Equipment

- PC with Windows 95 operating system
- SCSI Interface card
- SCSI cable
- RasterPlus95 software
- Support Software P/N 13699
- Microsoft PowerPoint
- Test image disk (p/n 13699)
- 35 mm Elite100 film
- 10X eye loop

Printing the Test Images

1. If you have not already done so, copy the test images 3POINT35.PPT and NEWEST.PPT from the test image disk (part number 13699) to the PC hard drive and make sure they are accessible by both Microsoft PowerPoint and RasterPlus95.
2. Connect the ProPalette unit to the SCSI adapter on the PC.
3. Turn on the ProPalette and wait for the "Ready" message.
4. Turn on the PC and wait for it to boot completely.
5. Load the 35mm Elite 100 film into the ProPalette camera.
6. Start RasterPlus95 and Microsoft PowerPoint
7. Verify that the software is configured for the SCSI port, 8K resolution and the correct film type in RasterPlus95. Ensure that the SCSI id number for the ProPalette matches the id number defined in RasterPlus95.
8. Print 3POINT35.PPT and NEWEST.PPT from Microsoft PowerPoint.
9. Have the film processed by a laboratory. (Do not have the slides mounted in frames.)
10. Evaluate the images according to the following sections, "3POINT35.PPT Evaluation" and "NEWEST.PPT Evaluation." If the images fail to meet the criteria in these sections, the ProPalette unit must be repaired.

3POINT35.PPT Evaluation

After the film returns from processing, use the 10x loupe to verify the quality of the 3POINT35.PPT image (Figure 4-16) as follows:

- **Gray levels.** The gray level of slide must have a clean appearance. There should be no evidence of intermittent lines of any color, banding or color tints.
- **Spots.** There must be no spots or marks of any kind. Spots or marks may result from dust or dirt on the face of the CRT, camera lens or filters. Ensure that the slide is clean. If the artifact is repeatable in every image, then the CRT must be cleaned or there might be a blemish on it's face. A single artifact on only one picture is probably from the film processing.

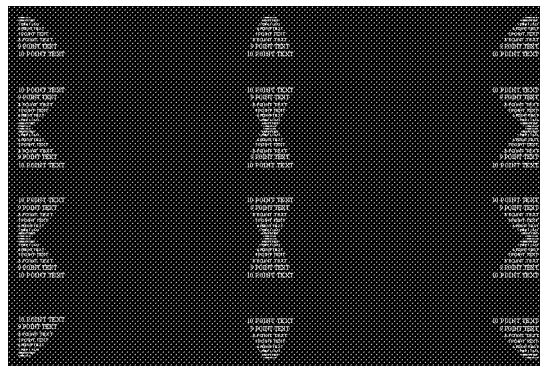


Figure 4-16. 3POINT35.PPT evaluation

NEWEST.PPT Evaluation

Use the 10x loupe to verify the quality of the NEWEST.PPT image (Figure 4-17) as follows:

- **Flesh tones.** Proper flesh tones in the woman's face, the face color must appear normal.
- **Gradients.** Smooth gray, red, green and blue gradients. No discontinuities must be visible.
- **Font sizes.** You must be able to resolve 3-point text through a 10x loop.
- **Halation.** There should be no evidence of halation (blurring or spreading of light) on the white blocks on the black background or the black blocks on the white background.
- **Color fidelity.** The primary additive (RGB) and subtractive (CMY) colors must look normal. Visually inspect the colors in the box next to the woman and in the colored circles on the right of the image.

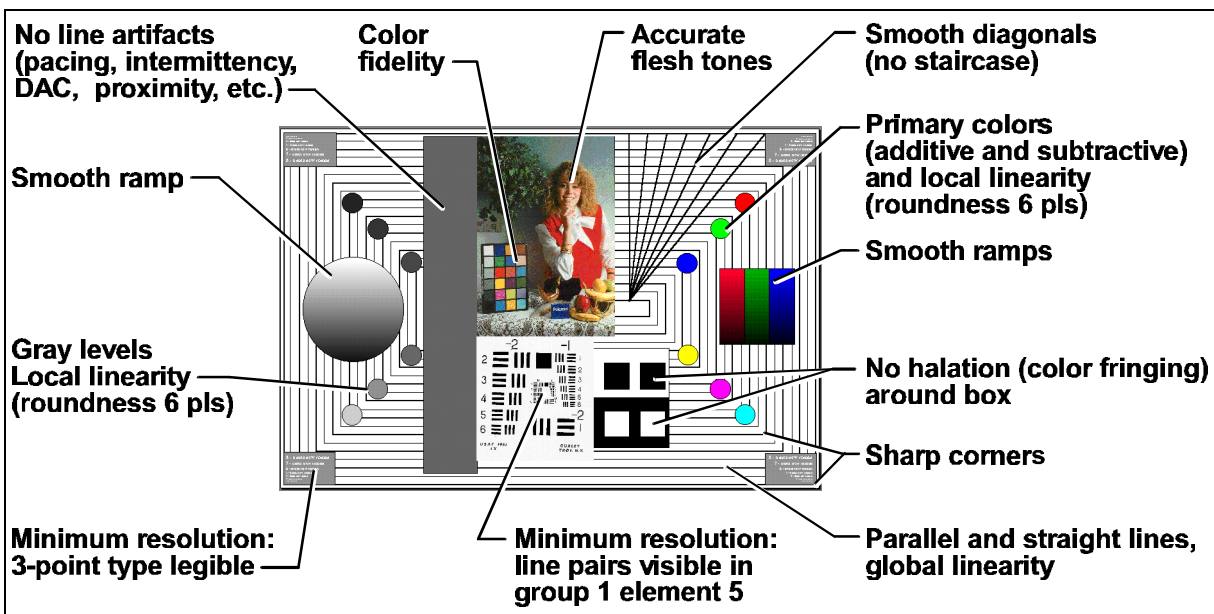


Figure 4-17. NEWEST.PPT evaluation

- **Resolution.** In the USAF resolution target you must be able to resolve the line pairs in group 1 - 5 when viewed with a 10X eye loop.
- **Gray levels.** The gray levels of the six circles on the left of the image and the vertical gray bar must have a clean appearance. There should be no evidence of intermittent lines of any color, banding or color tints in the gray areas.
- **Image geometry.** All horizontal and vertical lines must be straight and parallel. There should be no evidence of key-stoning, pin cushioning or barreling of the lines. The maximum deflection of a horizontal line is 0.011" as measured on the film. Ensure that the eye loop does not contribute any distortion to the evaluation.
- **Corners.** The corners should be a sharp 90 degrees and not rounded.
- **Diagonals.** The diagonal lines in the upper right portion of the image should not exhibit a staircase effect. The lines must be smooth.
- **Color registration.** Inspect for evidence of color fringing or shifts in the color planes in the colored circles.
- **Spots.** There must be no spots or marks of any kind. Spots or marks may result from dust or dirt on the face of the CRT, camera lens or filters. Ensure that the slide is clean. If the artifact is repeatable in every image, then the CRT must be cleaned or there might be a blemish on it's face. A single artifact on only one picture is probably from the film processing.

Error Message and Symptom Tables

This section contains error messages and symptoms with possible causes and suggested action for correction.

<u>Symptom Table</u>	<u>Page</u>
LCD Panel Error Messages	88
Host System Error Messages	91
Host System Plug-In Symptoms	93
Operation and Performance Symptoms	95
Image Quality Symptoms	101
Diagnostic (FPDIAG) Error Messages	102

LCD Panel Error Messages

Use the following table to troubleshoot and correct error messages appearing on the ProPalette LCD panel.

Note

Errors are displayed for only a few seconds on the LCD when they are detected. To redisplay an error, use the Show Last Error command on the ProPalette diagnostics menu accessible via the keypad.

<i>LCD Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
*CALIBRATION ERROR: CRT brightness doesn't smoothly vary	Transient firmware error	Retry.
	Autoluma calibration failure caused by light leak	Check for light leaks and correct as necessary.
*CALIBRATION ERROR: CRT Not bright enough	Unit not warmed up	Wait for recommended warmup period.
*CALIBRATION ERROR: CRT Not dim enough		
*CALIBRATION ERROR: Dark (x1) bad value		
*CALIBRATION ERROR: Dark (x1) not repeatable		
*CALIBRATION ERROR: Dark (x10) bad value		
*CALIBRATION ERROR: Dark (x10) not repeatable		
*CALIBRATION ERROR: Internal Error		
*CALIBRATION ERROR: Luma Not Smooth		

<i>LCD Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
*CALIBRATION ERROR: Requested FL too large	Unit not warmed up	Wait for recommended warmup period.
*CALIBRATION ERROR: Requested FL too small		
*CALIBRATION ERROR: Unit not warmed up		
*CALIBRATION ERROR: Video Not Smooth		
*CALIBRATION ERROR: x1 to x10 scale not same		
*Camera fuse blown	Faulty camera power fuse on digital board	Replace camera power fuse.
*Film door open	Internal startup diagnostic failure related to 35mm camera	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
*Film jammed		
*Film load failed		
*Film previously exposed, REMOVE IT		
*Filter wheel error		
*Out of film		
*Shutter FAILURE		
*Unit just powered on		
*Unknown camera back		
35mm Camera Test FAILED		

<i>LCD Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
DRAM Test FAILED	Internal startup diagnostic failure related to DRAM	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
	Faulty dynamic RAM	Replace digital board.
Dynamic Focus Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
Filter Wheel Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
Flash Memory Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
Horizontal Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
LCD/Keypad Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
Luma Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
V53-DSP SRAM Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.
	Faulty static RAM	Replace digital board.
Vertical Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.

<i>LCD Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Video Test FAILED	Internal startup diagnostic failure	Run FPDIAG diagnostics (page 72) for more detailed diagnosis.

Host System Error Messages

Use the following table to troubleshoot and correct error messages appearing on the host computer during ProPalette operation.

<i>Host System Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Film recorder not connected	Film recorder not properly connected to host or to AC power	Check all cables and connectors.
	Plug-in launched before ProPalette completed automatic startup and self-test	Close plug-in, wait for Ready message on ProPalette LCD panel, restart plug-in.
	ProPalette power switch off	1. Turn off host computer. 2. Turn ProPalette on. 3. Turn on host computer.
	SCSI address conflict	Check SCSI addresses and resolve any conflicts.
	Improper SCSI chain termination	Check termination and install terminator as needed.
	ProPalette hardware malfunction	Run FPDIAG (see page 72) to diagnose system.
Image too big to print	One or both image dimensions exceeds the maximum resolution	Using pixel units, resize the image as needed.
Incorrect film table	Film type selected with the plug-in does not match film type locked via the ProPalette front panel controls	Use the ProPalette front panel controls to unlock the selected film type.

<i>Host System Error Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Not enough memory to allocate data buffer	Host system or Windows configured with insufficient memory for ASPI (SCSI) communication	<p>Close all other applications and retry.</p> <p>or</p> <p>Use Microsoft MemMaker program and install EMM386 expanded memory manager.</p> <p>or</p> <p>View CFR.TXT (in the Photoshop Plugins directory) for additional suggestions.</p>
Downloaded film table bad table size	Film table directory contains non-ProPalette film tables	<p>Use the film table installation program to install the Polaroid Digital Palette film tables in a different directory.</p> <p>or</p> <p>Delete all non-ProPalette film tables from current film table directory.</p> <p>or</p> <p>See CFR.TXT (in the Photoshop Plugins directory) for additional suggestions.</p>

Host System Plug-In Symptoms

Use the following table to troubleshoot and correct problems with the ProPalette plug-in software installed on the host computer.

<i>Host System Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Palette Export does not operate properly	PaletteExport preferences file has an obsolete format from an earlier installation (Macintosh systems only)	<ol style="list-style-type: none"> 1. Delete the preferences file (System Folder:Preferences: PaletteExport Prefs). 2. Create a new preferences file by launching the plug-in.
Palette Export will not launch or does not operate properly after a crash	Damaged PaletteExport preferences file (Macintosh systems only)	<ol style="list-style-type: none"> 1. Delete the preferences file (System Folder:Preferences: PaletteExport Prefs). 2. Create a new preferences file by launching the plug-in.
Films pop-up menu contains no film names or a single, garbled film name	Film files not installed (Macintosh systems only)	Install either the GCC or NPKK driver and launch the plug-in.
Palette Export choice does not appear in Photoshop File/Export menu	Plug-in folder not selected during plug-in installation (Macintosh systems only) Old Photoshop version	<ol style="list-style-type: none"> 1. Use Find in the Finder to find the PaletteExport file. 2. Drag the PaletteExport file to the Photoshop plug-ins folder. 3. Restart Photoshop. Install Photoshop 2.5.1 or later
Photoshop's File/Export menu disabled	Image window not active Selected image is not RGB or grayscale	Open an RGB or grayscale image and make sure its window is active (selected). Convert image mode to RGB before opening the File menu.

<i>Host System Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Black and white film types disabled	Selected image is RGB	Select a grayscale image or convert selected image to grayscale before attempting to print.
Color film types disabled	Selected image is grayscale	Select an RGB image or convert selected image to RGB before attempting to print.
Cannot shift image to the edge of the aperture area	Border set to more than 0%	Set border to 0%.
Corrupted preview display	Transient software error (Macintosh systems only)	Cancel the plug-in and restart it.
Printing of image lags on-screen progress indicator for small images	ProPalette buffer receives entire image before printing cycle starts	Normal behavior for some small images; no action required.
Host system hangs up after ProPalette starts calibration (briefly displays “Calibration is not smooth” on LDC panel, resets, and displays “Ready”)	Transient firmware error resulting in autoluma calibration failure (Windows systems only)	<ol style="list-style-type: none"> 1. Reboot the host computer 2. Turn ProPalette off and back on. 3. Retry printing.
When printing a single image, ProPalette hangs up during the red, green or blue exposure period	Firmware error caused by the dimensions of the particular image	<ol style="list-style-type: none"> 1. Reset ProPalette. 2. Resize the image slightly (either larger or smaller). 3. Retry printing.
When printing multiple copies of an image, ProPalette hangs up during the red, green or blue exposure period	Firmware error	<ol style="list-style-type: none"> 1. Reset ProPalette. 2. Retry printing in batches of two.

Operation and Performance Symptoms

Use the following table to troubleshoot and correct problems observed in Palette operation and performance.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
ProPalette does not power up when power switch turned on; no message visible on LCD	No AC power at outlet	Check outlet for AC power and correct problem if power not present.
	Faulty line cord	Check line cord; replace if necessary.
	Faulty power switch	Check power switch; replace if necessary.
	Faulty power supply fuse	Inspect fuse F1 in power supply; replace if necessary.
	Faulty low-voltage power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty wiring or connections	Check wiring and connectors; tighten or replace as necessary.
	Faulty digital board	Check all components listed above; if none is faulty, replace digital board.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
ProPalette does not power up when power switch turned on; message on front panel	Faulty wiring or connectors	Check wiring and connectors; tighten or replace as necessary.
	Faulty low-voltage power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty digital board	Check all components listed above; if none is faulty, run digital board diagnostics to confirm fault and replace digital board.
ProPalette powers on, but LCD panel has no backlight	Faulty LCD panel	Check LCD panel; replace if necessary.
	No +24VDC power to LCD panel because of faulty wire	Check wiring to LCD panel and repair as needed.
	Faulty low-voltage power supply	Replace power supply.
ProPalette powers on, but LCD panel has only a blinking cursor	Corrupted flash memory	Reinstall firmware.
Propalette operates normally but no messages on LCD panel	Faulty LCD panel	Check LCD panel; replace if necessary.
	Faulty wiring or connectors	Check wiring and connectors; tighten or replace as necessary.
	Faulty power supply fuse	Inspect fuse F1 in power supply; replace if necessary.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Propalette operates normally but no messages on LCD panel (continued)	Faulty power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty digital board	Check all components listed above; if none is faulty, run digital board diagnostics to confirm fault and replace digital board.
ProPalette powers on but does not respond; LCD panel displays film type and number	Faulty communications circuitry on digital board	Replace digital board.
ProPalette powers on, displays CALIBRATING on LCD panel, then displays POWER, MESSAGE or SW ERR (software error)	Video problem on analog board	Run a test image and observe CRT for a scan line. If no scan line visible, replace analog board.
	Faulty autoluma board or analog board	Run a test image and observe CRT for a scan line. If scan line is visible, run analog board diagnostics and replace analog board, if necessary. If analog board checks OK, replace autoluma board.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Filter wheel indexes intermittently or not at all	Faulty stepper motor wiring or connectors	Check wiring and connectors; repair as necessary.
	Faulty stepper motor	Check stepper motor; replace if necessary.
	Faulty digital board	Check stepper motor as described above; if OK, run digital board diagnostics to confirm fault and replace digital board.
35mm camera does not function	Faulty 35mm camera	Check camera; replace if necessary.
	Faulty power supply fuse	Inspect fuse F1 in power supply; replace if necessary.
	Faulty low-voltage power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty wiring or connectors	Check wiring and connectors; tighten or replace as necessary.
	Faulty digital board	Check all components listed above; if none is faulty, run digital board diagnostics to confirm fault and replace digital board.
Unable to control image brightness via host computer	Faulty photocell (autoluma board?)	Check autoluma board; replace if necessary.
	Faulty analog board	Run analog board diagnostics; replace board if necessary.
	Faulty digital board	Run digital board diagnostics; replace board if necessary.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
CRT filament not lighted	Faulty power supply fuse	Inspect fuse F1 in power supply; replace if necessary.
	Faulty wiring or connectors	Check wiring and connectors; tighten or replace as necessary.
CRT filament not lighted (continued)	Faulty CRT connector	Check CRT connector; repair or replace if necessary.
	Faulty power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty CRT assembly	Check CRT; repair or replace if necessary.
	Faulty analog board	Run analog board diagnostics; replace board if necessary.
	Faulty digital board	Check all components listed above; if none is faulty, run digital board diagnostics to confirm fault and replace digital board.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
No video on CRT	Faulty power supply	Check power supply voltages at J2-2 (+5 Vdc \pm 0.10), J2-8 (+24 Vdc \pm 1.20), J2-11 (-15 Vdc \pm 0.45); J2-13 (+15 Vdc \pm 0.45), all referenced to J2-4. Replace if necessary.
	Faulty analog board	Run analog board diagnostics; replace board if necessary.
	Faulty digital board	Check all components listed above; if none is faulty, run digital board diagnostics to confirm fault and replace digital board.
No video or video has lines through white field	Faulty analog board	Run analog board diagnostics; replace board if necessary.
	Faulty digital board	Run digital board diagnostics to confirm fault and replace digital board.
Host will not boot when ProPalette is connected and powered on (Macintosh systems only)	The host's internal termination turns off briefly during startup	Disable internal termination and attach an external terminator.
Image prints very slowly	Pacing is enabled both through the ProPalette front panel controls and through the plug-in on the host system	Use the front panel controls to disable pacing, but leave it enabled (if desired) through the plug-in.
	Advanced and regular logging enabled (Windows systems only)	Disable all logging in the user dialog box unless needed for troubleshooting.
Firmware will not download via SCSI port; downloading via parallel port operates normally	Firmware error	Upgrade firmware.

<i>Symptom</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
35mm camera jams	Intermittent software error detects perforations when not expected	Retry printing.

Image Quality Symptoms

Use the following table to troubleshoot and correct ProPalette image quality problems.

<i>Image Quality Problem</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Fine horizontal density changes (“data-wait streaks”) usually accompanied by slow printing	Pacing is enabled both through the ProPalette front panel controls and through the plug-in on the host system	Use the front panel controls to disable pacing, but leave it enabled (if desired) through the plug-in.
Color shift visible in dark grays	Software error affecting autoluma image	Upgrade firmware and calibrate unit.
Density and color-balance shifts in dark grays in corners of images	Cos ⁴ settings non-optimal	Upgrade firmware and calibrate unit.
Color balance shifts	Autochroma not implemented	Upgrade firmware and color-calibrate
Pictures have dark corners	ProPalette out of calibration	Recalibrate unit.
	Faulty analog board	Run analog board diagnostics; replace board if necessary.
	Faulty digital board	Check analog board as described above; if OK, run digital board diagnostics to confirm fault and replace digital board.

Diagnostic (FPDIAG) Error Message Tables

This section lists the error messages that can be generated by the ProPalette internal startup diagnostics or the diagnostics program (FPDIAG), along with possible causes and corrective actions for each.

Filter Wheel Stepper Motor Driver Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Error homing filter wheel	Faulty photointerrupter or photointerrupter cable	Check cable connections, cable and photointerrupter; replace if necessary.
Error indexing filter wheel	Faulty stepper motor or motor cable	Check cable connections, cable and motor; replace if necessary.
	Faulty components on digital board	Replace digital board.

V53-DSP SRAM Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
SRAM bit test failure: SB	Faulty digital board	Replace digital board
SRAM walking ones test failure: SB		
Polled BIO check: Bad SRAM Data, SB		
BIO check with DPS hold: Bad SRAM Data, SB		
Wrote to the DSP_Data Port and the BIO line isn't set		
Wrote to the DPS_Data Port, then wrote and read some SRAM locations and the BIO line got cleared		
error from start_dma, bad channel		
error from start_dma, DMA already running		
error from start_dma, odd address		
unknown error from start_dma		
DMA transfer won't complete		
DMA Xfer test: Bad Data, SB		

35mm Camera Interface Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Film already loaded	Film already in camera	Rewind and remove film; restart test.
	Film was removed after partially used	Rewind film via keypad commands; restart test.
Attempted film move with door open	Camera door unlatched	Close camera door.
	Faulty door-closed sensor	Replace camera
	Faulty camera cable	Check cable and replace camera if necessary.
	Faulty digital board	Replace digital board.
Read illegal DX code	Damaged film cartridge	Try a different film cartridge.
	Damaged or dirty DX code sensors	Clean sensors or replace camera.
	Faulty camera cable	Check cable and replace camera if necessary.
	Faulty digital board	Replace digital board.
X-connector transition T.O.	Shutter failed to open due to faulty camera or camera cable	Replace camera.
	Shutter failed to open due to faulty digital board	Replace digital board.

35mm Camera Interface Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Counted too few perforations	Dirty perforation photosensor	Clean photosensor
Counted too many perforations	Faulty perforation photosensor	Replace camera.
Perforation T.O., rewind direction	Camera out of calibration Faulty digital board	Replace camera Replace digital board.
Perforation T.O., during load		
Perforation T.O., L->H on load-rewind		
Perforation T.O., H->L on load-rewind		
Attempted film move with shutter open	Firmware logic error	Notify Engineering.
Attempted film advance with no film	No film in camera	Load film.
	Faulty camera cable	Replace camera.

DRAM Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Bad Memory in block starting at xxxx	Faulty digital board	Replace digital board.

Flash Memory Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Reported Flash size is 0 (zero) K. Test aborted.	Firmware logic error	Upgrade or reload firmware.
	Faulty digital board	Replace digital board.
Flash directory is corrupted!	Firmware logic error	Upgrade or reload firmware.
	Faulty digital board	Replace digital board.
Error erasing! First non-blank entry:	Faulty digital board	Replace digital board.
Error programming block	Faulty digital board	Replace digital board.

LCD/Keypad Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Did NOT sense all keypad keys	Test timed out before buttons were pressed	Restart test and press all buttons.
	Faulty LCD/keypad module	Replace LCD/keypad module.

Horizontal Channel Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Horizontal Test Failed	Faulty CRT yoke	Replace yoke.
	Faulty analog board	Replace analog board.

Vertical Channel Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Vertical Test Failed	Faulty CRT yoke	Replace yoke.
	Faulty analog board	Replace analog board.

Video Channel Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Video Test Failed	Faulty CRT yoke	Replace yoke.
	Faulty analog board	Replace analog board.

Luma Trimdac Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Bad Luma Hi gain	Faulty analog board	Replace analog board.

Dynamic Focus Test		
<i>Message</i>	<i>Possible Cause</i>	<i>Corrective Action</i>
Bad Dyfoc slope	Faulty analog board	Replace analog board.

5. Test Stand Operation

Test Stand Description

The ProPalette test stand Figure 5-1 is a system of hardware and software for testing and calibrating the ProPalette unit. It consists of the following components:

- Desktop computer
- System (computer) monitor
- Alignment CCD camera
- Film plane CCD camera
- Photosensor
- Video monitor
- System tester
- Voltmeter
- Bias Box
- Standard 35mm Camera
- Custom software
- Custom cables

For a more detailed description of the test stand, with instructions for setting it up and calibrating components, see *ProPalette Test Stand Setup and Calibration* (a separate document).

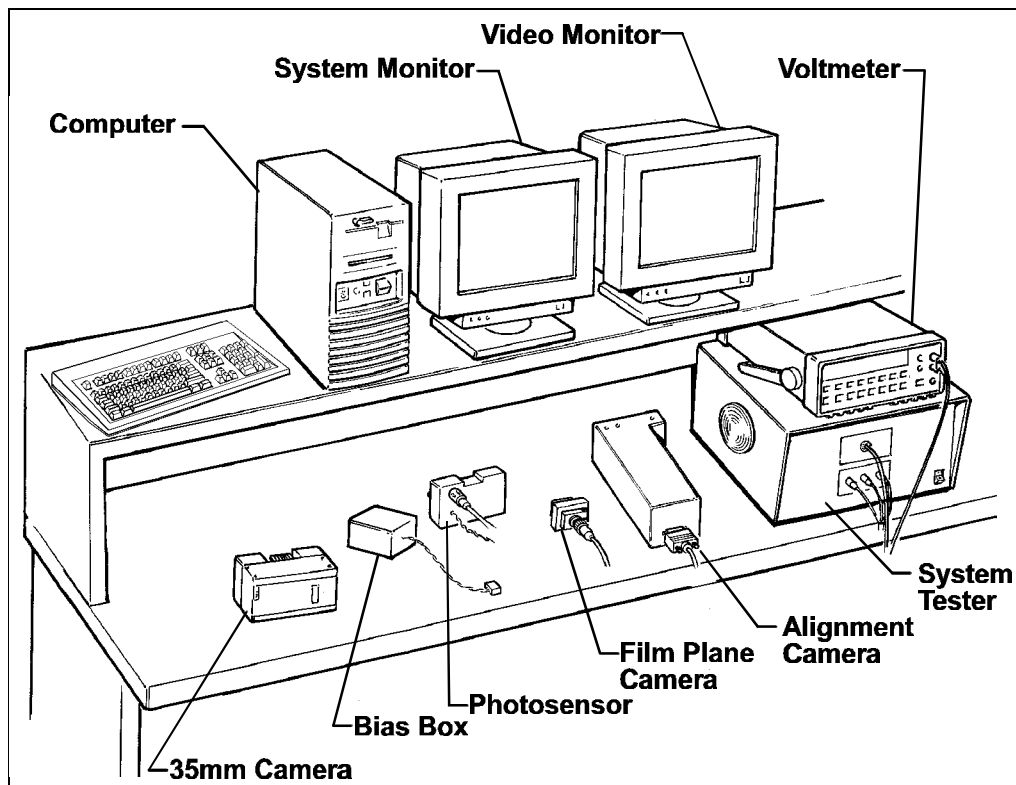


Figure 5-1. ProPalette test stand

Test Stand Functions

Test Stand operation consists of these operations, which can be performed in the sequence given or individually as needed:

<u>Function</u>	<u>Description</u>	<u>Page</u>
Upgrading ProPalette firmware	Writes the most current version of firmware to the ProPalette flash memory	113
Performing a functional test	Verifies operation of the ProPalette Digital Board and the components it controls	114
Checking yoke position	Verifies that the CRT yoke is positioned for a perfectly upright image	117
Testing the Analog Board	Tests several Analog Board circuits for proper operation	124
Aligning the ProPalette	Determines precise correction factors required for image geometry, dynamic focus, and autoluma and writes them to the ProPalette flash memory.	131
Focusing the 35mm camera	Positions the lens of the 35mm camera back for precise focus of the CRT image at the camera film plane.	134

Test Stand Calibration

The test stand alignment camera and film plane camera require periodic calibration. See *ProPalette Test Stand Setup and Calibration* for those procedures.

Connecting ProPalette and Powering Up the Test Stand

Before starting any of the test stand procedures in this section, connect the ProPalette cables and power up the test stand as follows:

1. Connect the following cables to the ProPalette unit (Figure 5-2):

- a. Power cable

Note

Always **connect the power cable first** to ground the unit and prevent damage from static discharge.

- b. Serial cable. If necessary, remove the label covering the RS-11 serial connector on the ProPalette.
 - c. SCSI cable (to either SCSI connector). Make sure the SCSI cable is properly terminated.
 - d. Parallel cable
 - e. Sync cable
2. Install the standard 35mm camera on the ProPalette unit.
 3. Turn on the ProPalette unit and wait for it to initialize.
 4. Turn on the system monitor, the video monitor, the System Tester, and the voltmeter.

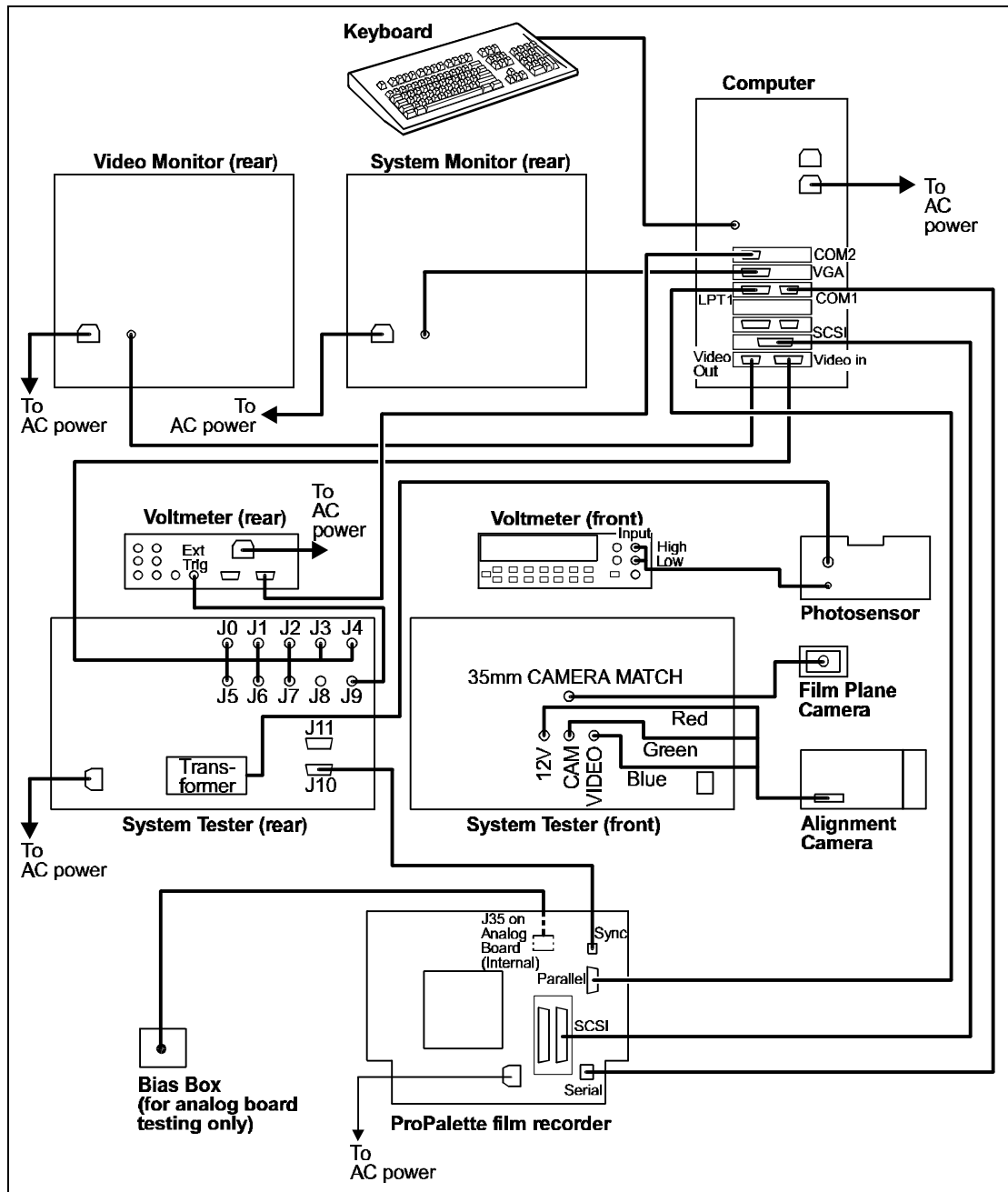


Figure 5-2. Connecting the ProPalette to the Test Stand

5. Turn on the test stand computer and wait for the main test stand menu (Figure 5-3) to appear on the system monitor.

Note

The system is set up to display the main test stand menu at startup.
To reach the menu from a DOS prompt: (1) log into the directory C:\PROPALET, (2) type **service**, and (3) press the Enter key.

6. Choose Operator ID by pressing F2, type your operator ID, then press Enter to return to the main test stand menu.

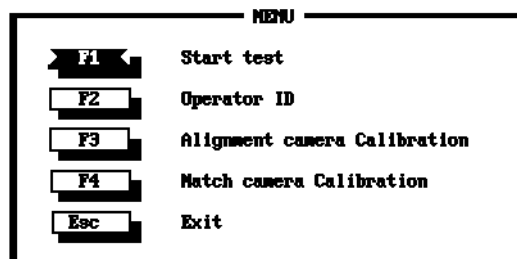


Figure 5-3. Main test stand menu

Upgrading ProPalette Firmware

Required Tools and Equipment

- ProPalette Test Stand and associated fixtures
- Current ProPalette firmware version

Note

If you are not sure that the test stand has the current version of firmware for uploading to the ProPalette unit, see “Obtaining the Latest Firmware Version” in *ProPalette Test Stand Setup and Calibration* (a separate document) before proceeding.

Setup

1. If you have not already done so, connect the ProPalette to the Test Stand and power up the Test Stand as described on page 110.
2. Wait for the "Ready out of film" message to appear on the ProPalette LCD.
3. Choose Start Test (press F1) to display the test menu (Figure 5-4).
4. Choose Upgrade Firmware by pressing F1.
5. Follow instructions on the screen to upgrade the firmware.

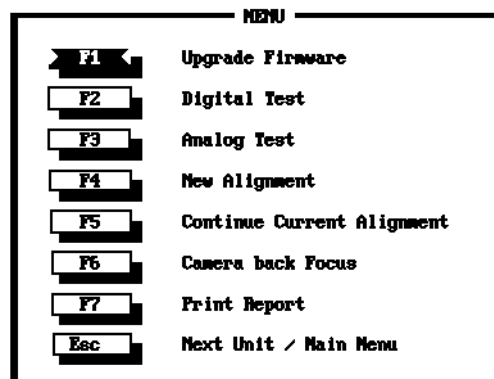


Figure 5-4. Test menu

Testing the Digital Board

The procedure in this section tests the Digital Board and the components it controls.

Required Tools and Equipment

ProPalette Test Stand and associated fixtures

Functional Test

1. If you have not already done so, connect the ProPalette to the Test Stand and power up the Test Stand as described on page 110.
2. If the ProPalette unit is on, turn it off.
3. Turn on the ProPalette and watch the ProPalette LCD to verify that the correct firmware version is installed. If it is not, see “Upgrading ProPalette Firmware” on page 113.
4. Wait for the "Ready out of film" message to appear on the ProPalette LCD.
5. Choose Start Test (press F1) to display the test menu (Figure 5-5).

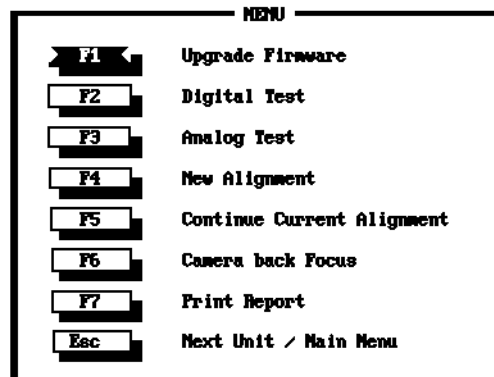


Figure 5-5. Test menu

6. Choose Digital Test by pressing F2.

The first digital test screen (Figure 5-6) appears.

7. Press the reset button on the back of the ProPalette unit.
8. Wait for the digital test menu (Figure 5-7) to appear. (This may require more than the 60 seconds indicated on the screen.)

ProPalette Functional Test (v1.0)		
Operator ID: SDFGHJ		Ser.No: 232123
<p>Please Connect Serial, Parallel, SCSI and Power Cables and Reset the Unit with a Fresh Power-up.</p> <p>Please wait for about 60 sec while unit runs its diagnostics.</p>		

Figure 5-6. First digital test screen

ProPalette Functional Test (v1.0)		
Operator ID: SDFGHJ		Ser.No: 232123
<div>F1 Run All Tests</div> <div>F2 Filter Wheel Test</div> <div>F3 Camera Back Test</div> <div>F4 Memory Test</div> <div>F5 Centronics Test</div> <div>F6 SCSI Test</div> <div>F7 LCD/Keypad Test</div> <div>F8 Yoke Adjustment</div> <div>ESC Exit</div>		

Figure 5-7. Digital test menu

9. Choose Run All Tests by pressing F1.

The system automatically runs the following tests in sequence:

- Filter wheel test
- Camera back test
- Memory test
- Centronics (parallel port) test
- SCSI test
- LCD/keypad test*

Note

During the LCD/keypad test, press each of the four ProPalette keypad keys when directed by the instructions on the system monitor.

10. As the tests run, watch the status messages at the bottom of the screen (Figure 5-8) for any error conditions.

11. Wait for a message indicating that all the tests have been completed.

If any error conditions are indicated at the bottom of the screen, refer to "Digital Test Error Messages" in the following section for possible causes and corrective action. After taking the corrective action, restart this procedure at step 1 to verify that the problem has been eliminated.

ProPalette Functional Test (v1.0)		
Operator ID: SDFGHJ		Ser.No: 232123
F1	Run All Tests	RED FILTER PASS
F2	Filter Wheel Test	GREEN FILTER PASS
F3	Camera Back Test	BLUE FILTER PASS
F4	Memory Test	CLEAR FILTER PASS
F5	Centronics Test	LOAD FILM PASS
F6	SCSI Test	SHUTTER OPENING PASS
F7	LCD/Keypad Test	SHUTTER CLOSING PASS
F8	Yoke Adjustment	ADVANCE FILM PASS
		REWIND FILM PASS
		SRAM Memory Test PASS
		DRAM Memory Test PASS
		FLASH Memory Test PASS
		Centronics Test PASS
		SCSI Test FAIL
ESC	Exit	
*** ERROR *** SCSI Test Failed		

Status message

Figure 5-8. Status messages during digital tests

12. If you are not checking the yoke position, choose Exit by pressing the Esc key.

If you are checking yoke position, do not press Esc. Instead, proceed to “Checking Yoke Position” below.

Digital Test Error Messages

If error messages appear on the system monitor during the digital test, refer to Diagnostic (FPDIAG) Error Message Tables on page 87 for troubleshooting information.

Checking Yoke Position

Use this procedure if a new CRT yoke has been installed or if you suspect that the CRT yoke has rotated from its original position.

Required Tools and Equipment

ProPalette Test Stand and associated fixtures are required to check the yoke position. If the yoke requires adjustment, you also need the following tools and equipment:

- Torque-limiting nut driver (120 in.-oz.)
- Nut driver
- Phillips-head screwdriver
- Hot-melt glue gun and adhesive (electronics assembly grade)
- RTV sealant

Yoke Position Check

1. If you have not done so, perform the Digital Board test. (Instructions start on page 114.) Be sure to troubleshoot and correct any errors reported by the functional test before continuing.

At the end of the test, do **not** press the Esc key. (Leave the digital test menu, Figure 5-9, on the screen.)

ProPalette Functional Test (v1.0)	
Operator ID: SDP063	Ser.No: 232123
<input type="checkbox"/> F1 Run All Tests	RED FILTER PASS
<input type="checkbox"/> F2 Filter Wheel Test	GREEN FILTER PASS
<input type="checkbox"/> F3 Camera Back Test	BLUE FILTER PASS
<input type="checkbox"/> F4 Memory Test	CLEAR FILTER PASS
<input type="checkbox"/> F5 Centronics Test	LOAD FILM PASS
<input type="checkbox"/> F6 SCSI Test	SHUTTER OPENING PASS
<input type="checkbox"/> F7 LCD/Keypad Test	SHUTTER CLOSING PASS
<input type="checkbox"/> F8 Yoke Adjustment	ADVANCE FILM PASS
<input type="checkbox"/> ESC Exit	REWIND FILM PASS
	SRAM Memory Test PASS
	DRAM Memory Test PASS
	FLASH Memory Test PASS
	Centronics Test PASS
	SCSI Test PASS
	LCD/Keypad Test PASS
Test Completed.	

Figure 5-9. Digital test menu

2. Remove the 35mm test camera (if installed) from the ProPalette unit.
3. Install the alignment CCD camera on the ProPalette unit (Figure 5-10).
4. Disconnect the CAM connector from the front of the system tester.
5. Press F8 to start the yoke adjustment program and display the yoke alignment image (Figure 5-11) on the video monitor.
6. If necessary, adjust the brightness of the yoke alignment image by holding the Alt key and pressing the Up Arrow key or Down Arrow key.

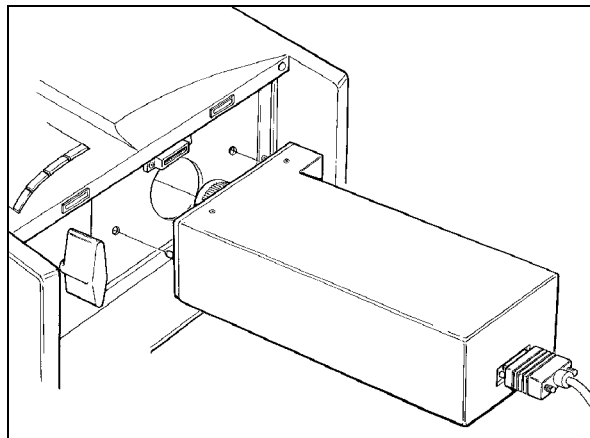


Figure 5-10. Installing the alignment camera on the ProPalette

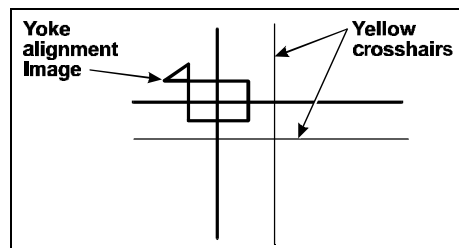


Figure 5-11. Yoke alignment image

7. Reposition the alignment image to the center of the monitor (Figure 5-12) by pressing the Arrow keys.

Note

If you cannot see the image on the video monitor, remove the alignment CCD camera from the ProPalette. Then perform steps 5 and 6 to adjust the brightness and position of the image while viewing the ProPalette CRT through the camera opening. Once the image is roughly centered on the CRT, reinstall the alignment CCD camera and return to step 5.

8. Verify that the alignment image horizontal and vertical bars are aligned with the yellow crosshairs (not rotated) and that the small triangle is positioned at the upper left quadrant of the rectangle (Figure 5-12).
9. If the image is not properly oriented, go to “Yoke Adjustment” in the next section.

If the image is properly aligned, press Esc to return to the digital test menu. Then press the Esc key to return to the test menu. Reconnect the CAM connector on the front of the system tester.

10. Press the Reset button on the back of the ProPalette.

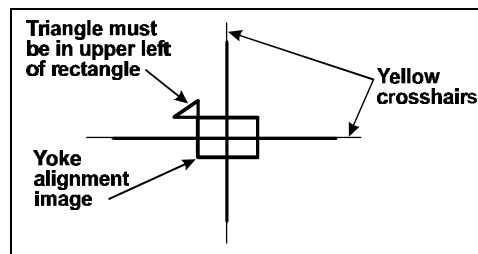


Figure 5-12. Yoke alignment image properly oriented and aligned

Yoke Adjustment

1. Turn off the ProPalette power switch and disconnect all the cables from the rear of the ProPalette unit.

Note

Disconnect the AC power cord last.

2. Remove the top cover and rear panel assembly as follows:
 - a. Turn the ProPalette unit upside down on the workbench.

- b. Remove the ten #6-32 x ¼ Phillips pan head screws securing the top cover to the pan and the three #6-32 x ½ Phillips pan head screws securing the rear panel to the pan (Figure 5-13).
- d. Turn the ProPalette unit right-side-up and remove the three screws securing the rear panel to the ProPalette electronics drawer (Figure 5-14).
- e. Carefully slide the top cover and rear panel toward the rear and remove it from the ProPalette unit.

Warning

To avoid risk of high-voltage shock, verify that the ProPalette is disconnected from AC power before continuing to the next step.

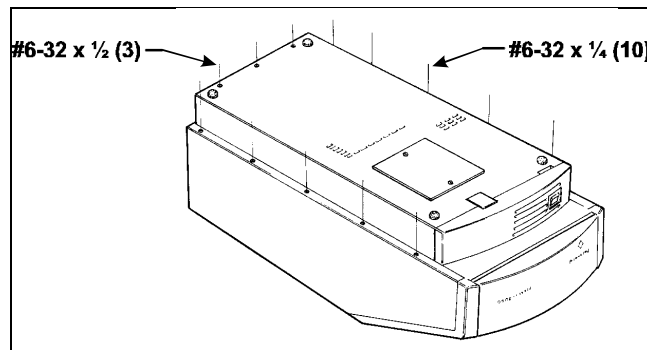


Figure 5-13. Removing top cover and rear panel pan screws

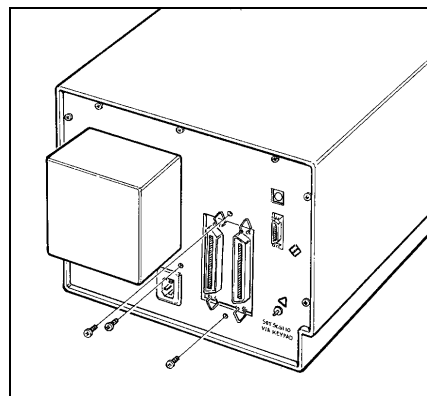


Figure 5-14. Removing rear panel screws

4. Disconnect the round connector from the end of the CRT and remove the sheet-metal screw securing the Mu-metal grounding lug (Figure 5-15).
5. Remove the foam light seal (Figure 5-15) by sliding it off the end of the CRT tube.
6. Disconnect the yoke cables passing through the Mu-metal shield grommet (Figure 5-15) at their connectors on the analog board, then slide the grommet out of the Mu-metal shield.
7. Remove the two stop nuts and washers securing the Mu-metal shield and the ground strap to the light box (Figure 5-16).
8. Slide the Mu-metal shield back far enough to expose the high-voltage connector on the CRT (Figure 5-16).
9. Unplug the high-voltage connector from the side of the CRT and pull the high-voltage wire and connector out through the end of the Mu-metal shield.
10. Slide the Mu-metal shield backward and completely remove it from the CRT.

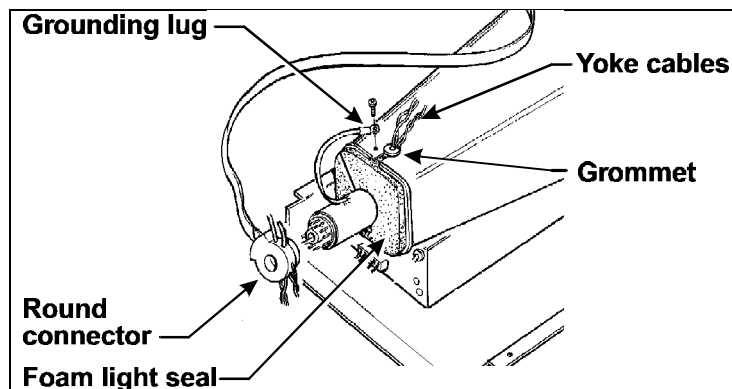


Figure 5-15. Disconnecting the CRT

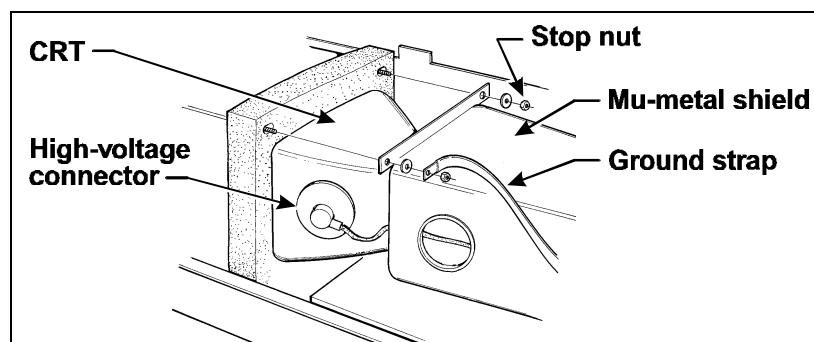


Figure 5-16. Removing the large Mu-metal shield

11. Reattach the high-voltage connector to the CRT, the yoke cable to the analog board, and the round connector to the end of the CRT.
12. Loosen the yoke clamping screw (Figure 5-17).
13. Use a hot-melt glue gun to soften the hot-melt adhesive securing the yoke to the CRT (Figure 5-17) and gently twist the yoke to release the adhesive grip.
14. Reconnect the ProPalette power cable, SCSI cable, serial cable and parallel cable to the back of the ProPalette.
15. Install the alignment CCD camera on the ProPalette if it is not already installed.
16. Turn the ProPalette power switch to on and wait for it to initialize.

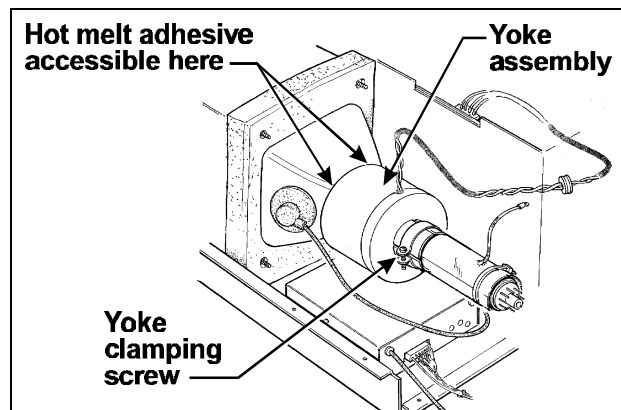


Figure 5-17. Yoke clamping screw and hot-melt adhesive

17. View yoke alignment image on screen (Figure 5-18).

If necessary, adjust the brightness of the yoke alignment image by holding the Alt key and pressing the Up Arrow key or Down Arrow key. Reposition the alignment image to the center of the monitor by pressing the Arrow keys.

18. Twist the yoke assembly until the alignment image is rotationally aligned with the cross-hairs. Make sure the small triangle is positioned in the upper left quadrant of the larger rectangle (Figure 5-19).
19. Using a torque-limiting nut driver, tighten the yoke clamp (Figure 5-17 on page 122) to 120 inch-ounces.

Warning

**Do not attempt to tighten the clamp without a torque-limiting device.
Overtightening could cause the CRT to implode.**

20. Apply hot melt adhesive between the yoke and CRT to help prevent the yoke from rotating.
21. Remove the alignment CCD camera from the ProPalette unit.
22. Press the Reset button on the back of the ProPalette.
23. Proceed to “Assembly After Yoke Adjustment” in the following section.

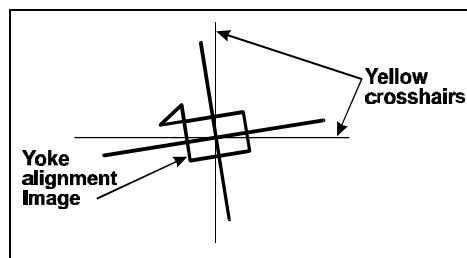


Figure 5-18. Yoke alignment image before yoke adjustment

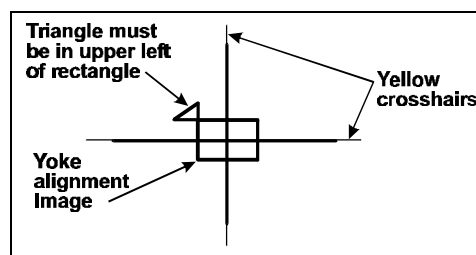


Figure 5-19. Yoke alignment image after yoke adjustment

Assembly After Yoke Adjustment

1. Turn off the ProPalette power switch and disconnect all the cables from the rear of the ProPalette unit.

Note

Disconnect the AC power cord last.

Warning

To avoid risk of high-voltage shock, verify that the ProPalette is disconnected from AC power before continuing to the next step.

2. Disconnect the yoke cables from the analog board, the high-voltage cable from the side of the CRT, and the round connector from the end of the CRT.
3. Slide the Mu-metal shield partially onto the CRT, then thread the yoke cable through the shield so it extends out of the back of the shield. Feed the CRT high-voltage cable through the shield in the opposite direction.
4. Attach the high-voltage connector to the side of the CRT (Figure 5-20).
5. Slide the Mu-metal shield onto its mounting studs, making sure the high-voltage connector is visible through the hole in the side of the shield.

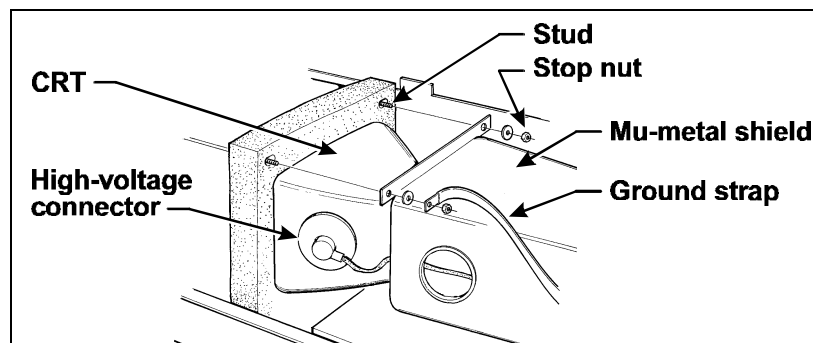


Figure 5-20. Sliding the shield onto its mounting studs

6. Press the yoke cable grommet into its hole on the Mu-metal shield (Figure 5-21).
7. Connect the round connector to the end of the CRT (Figure 5-22).

Note

Make sure the two unused black wires in the harness are positioned so their conductors do not contact any metal surfaces.

8. Using washers and locknuts, secure the Mu-metal shield to the studs. Capture the grounding strap lug between the washer and the nut on the outside stud (Figure 5-20).

Note

Tighten the nuts so the foam lightshield around the studs deforms only slightly. Overtightening will deform the Mu-metal and cause light leaks.

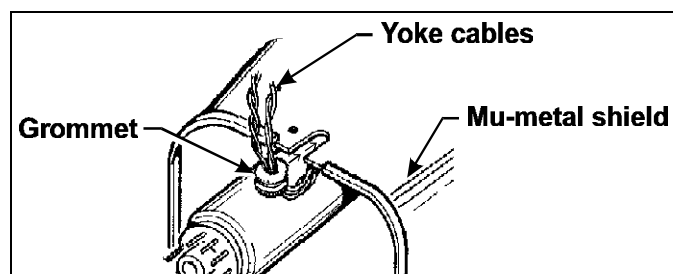


Figure 5-21. Installing the yoke cable grommet

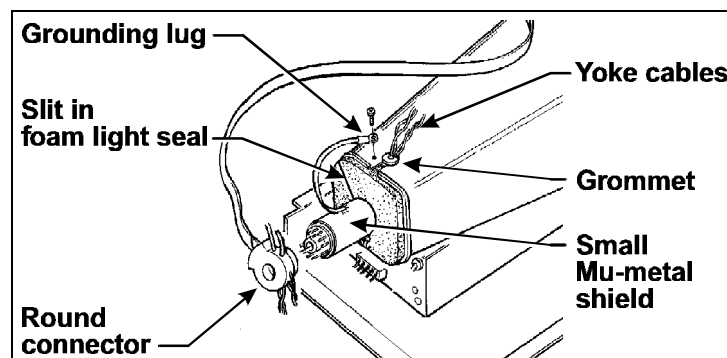


Figure 5-22. Installing the light seal and connecting CRT cables

9. Install the foam light seal in the rear of the Mu-metal shield (Figure 5-22). Be sure the opening slit is in the upper left.

Note

While sliding the light seal into the large Mu-metal shield, hold the small Mu-metal shield around the CRT neck to keep it from sliding forward. After the light seal is installed, verify that the small Mu-metal shield is all the way back (as close as possible to the connector on the end of the CRT) so the CRT glass surface is not visible.

10. Attach the ground cable lug to the large Mu-metal shield with a sheet metal screw (Figure 5-22).
11. Connect the yoke cable to the analog board.
12. Dress all the wires near the back of the CRT by tucking them under the CRT.

Note

The analog board test requires access to internal components. If you will be testing the analog board (page 129), perform the test before you install the cover and screws as described in the next steps.

13. Move the SCSI connector locking ears to the closed position to allow the rear cover to pass over them and the connectors.
14. Carefully slide the main cover and rear panel forward onto the unit until it interlocks with the front bezel assembly. You may need to lift the top of the cover slightly to pass over interior hardware. Use caution to avoid pinching wires.
15. Install the rear cover securing screw above the power connector (Figure 5-23).

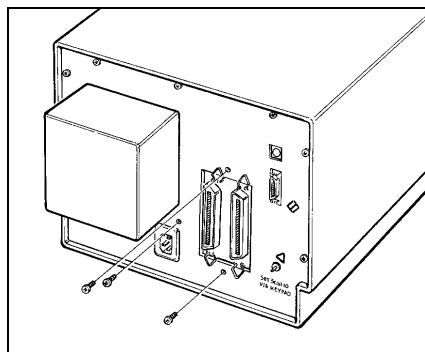


Figure 5-23. Installing the rear cover screws

16. Install the cover-securing screws above and below the SCSI connectors. (You may need to use a small screwdriver to push the electronics drawer slightly right or left to align its screw holes.)
17. Turn the ProPalette unit upside-down and install the screws securing the main and rear covers to the pan assembly (Figure 5-24).

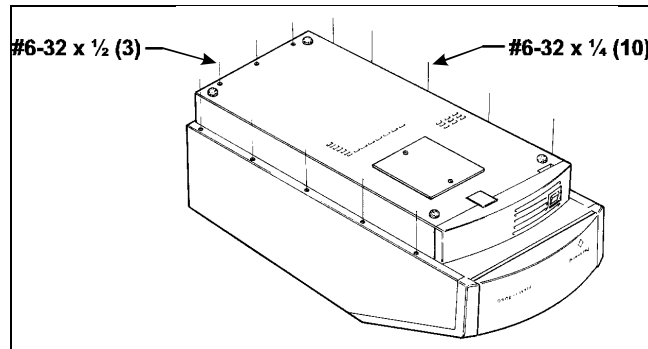


Figure 5-24. Securing the main cover to the pan assembly

Testing the Analog Board

Required Tools and Equipment

- ProPalette Test Stand and associated fixtures
- Test stand bias box

Setup

1. If you have not done so already, turn the ProPalette upside down and remove the 13 screws securing the main and rear covers to the pan (Figure 5-24 above). Then turn the unit right-side-up and remove the three screws securing the the ProPalette back cover to the electronics drawer (Figure 5-25).

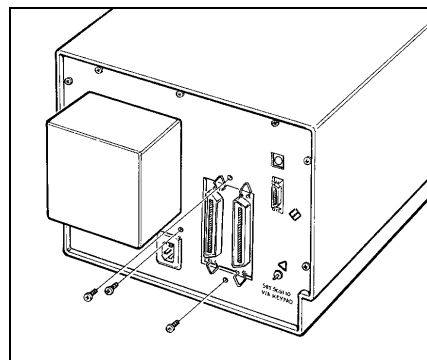


Figure 5-25. Removing the rear cover screws

2. Slide the ProPalette main cover and rear cover back and remove them from the unit.
3. Disconnect the autoluma cable from J35 on the analog board (Figure 5-26) and connect the bias box cable in its place.
4. Connect the ProPalette to the Test Stand and power up the Test Stand as described on page 110.
5. If you have not already done so, verify that the ProPalette unit has the latest firmware version installed as follows:
 - a. If the ProPalette unit is on, turn it off.
 - b. Turn on the ProPalette and watch the ProPalette LCD.
 - c. Verify that the correct firmware version is displayed on the LCD during power-up. If it is not, follow instructions in “Upgrading ProPalette Firmware” on page 113 before continuing.

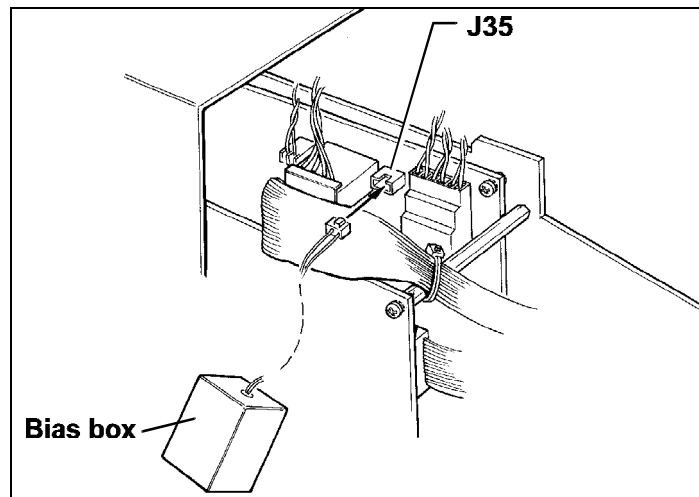
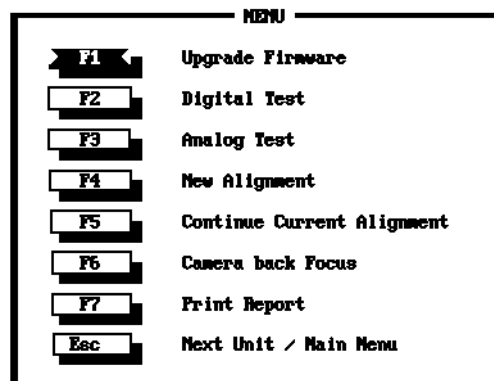
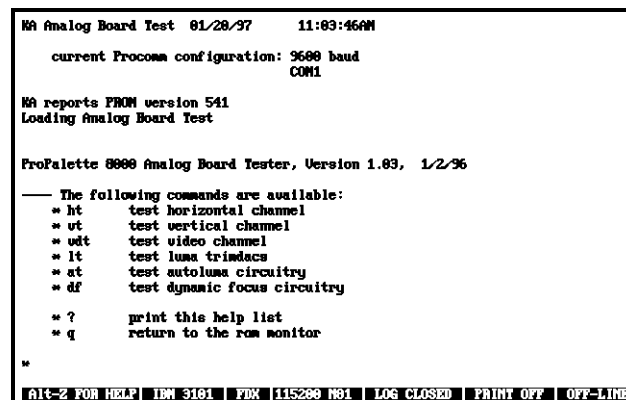


Figure 5-26. Connecting the bias box to J35 on the Analog Board

Analog Board Test

1. Install the standard 35mm camera on the ProPalette unit.
2. Choose Start Test (press F1) to display the test menu (Figure 5-27).
3. Choose Analog Test by pressing F3, and wait for the analog test screen (Figure 5-28) to appear.

*Figure 5-27. Test menu**Figure 5-28. Analog test screen*

4. Run each of the following tests by typing the appropriate command, pressing Enter, and waiting for a message indicating that the unit passed the test:

<u>Analog Board Test</u>	<u>Command</u>
Horizontal channel	ht
Vertical channel	vt
Video channel	vdt
Luma trimdacs	lt
Autoluma circuitry	at
Dynamic focus circuitry	df

If any error conditions are indicated at the end of any test, refer to “Analog Test Error Messages” in the next section for possible causes and corrective action. After taking the corrective action, restart this procedure at step 1 to verify that the problem has been eliminated.

5. Exit from the analog test program and return to the main menu by typing **q**, pressing Enter, pressing ALT + x, and typing **y**.
6. Turn the ProPalette power switch to off.
7. Disconnect the cables from the ProPalette.

Note

Disconnect the power cord last.

8. Reinstall the ProPalette covers as follows:
 - a. Move the SCSI connector locking ears to the closed position to allow the rear cover to pass over them and the connectors.
 - b. Carefully slide the main cover and rear panel forward onto the unit until it interlocks with the front bezel assembly. You may need to lift the top of the cover slightly to pass over interior hardware. Use caution to avoid pinching wires.
 - c. Install the rear cover securing screw above the power connector (Figure 5-23 on page 126).
 - d. Install the cover-securing screws above and below the SCSI connectors. (You may need to use a small screwdriver to push the electronics drawer slightly right or left to align its screw holes.)

- e. Turn the ProPalette unit upside-down and install the screws securing the main and rear covers to the pan assembly (Figure 5-24 on page 127).

Analog Test Error Messages

If any error messages appear, refer to “Diagnostic (FPDIAG) Error Message Tables” on page 102 for troubleshooting information.

Aligning the ProPalette

Alignment has these main procedures:

- Setup
- Initial Autoluma calibration
- Geometry calibration
- Dynamic focus
- Final autoluma adjustment

Required Tools and Equipment

ProPalette Test Stand and associated fixtures

Setup

1. Connect the ProPalette to the Test Stand and power up the Test Stand as described on page 110.
2. If you have not already done so, verify that the ProPalette unit has the latest firmware version installed as follows:
 - a. If the ProPalette unit is on, turn it off.
 - b. Turn on the ProPalette and watch the ProPalette LCD.
 - c. Verify that the correct firmware version is displayed on the LCD during power-up. If it is not, follow instructions in “Upgrading ProPalette Firmware” on page 113 before continuing.
3. Reset the ProPalette by pressing the Reset button on the back of the unit.
4. Let the ProPalette warm up for at least 30 minutes.
5. Choose Start Test by pressing F1.

6. Type the serial number of ProPalette unit being calibrated and press Enter to display the test menu (Figure 5-29).

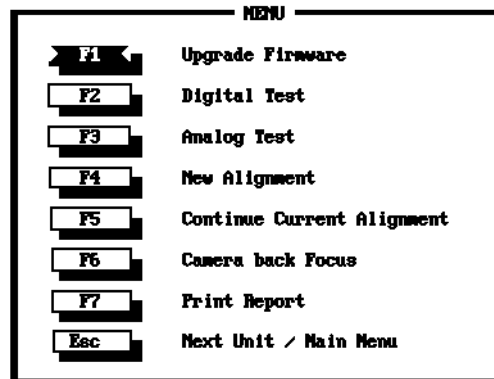


Figure 5-29. Test menu

Initial Autoluma Calibration

1. Choose New Alignment from the test menu by pressing F4. The message "Attach photosensor to unit" appears.
2. Attach the photosensor (Figure 5-30) to the ProPalette unit.
3. Start the preliminary autoluma calibration by pressing Enter.

Initial autoluma calibration progress is displayed in the lower right of the system monitor and "Calibrating" appears on the ProPalette LCD panel.

4. Wait for the alignment system to reset the ProPalette, and to display the message "Attach the CCD camera to the unit" indicating that initial autoluma calibration is complete.

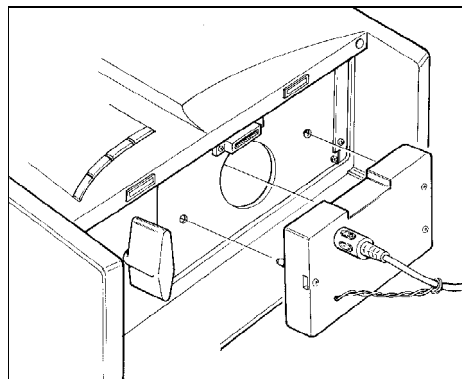


Figure 5-30. Attaching the photosensor

Geometry Calibration

1. Remove the photosensor from the ProPalette unit and install the alignment CCD camera (Figure 5-31) when directed by the on-screen instructions.
2. Start the geometry alignment sequence by pressing Enter.

The display monitor shows boxes and grids as the system proceeds through geometry alignment using various grid sizes. This process requires several minutes.

3. Wait for the message "Attach photosensor to the film printer," indicating that geometry calibration has been completed.
4. Proceed to dynamic focus adjustment in the next section.

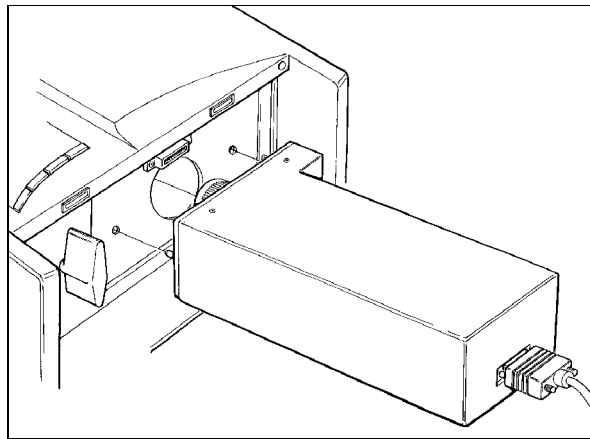


Figure 5-31. Attaching the alignment camera

Dynamic Focus and Final Autoluma Adjustment

1. Remove the alignment CCD camera from the ProPalette unit and install the photosensor (Figure 5-30 on page 132).
2. Press Enter to start the dynamic focus adjustment.

The adjustment may require a few minutes; progress is displayed on the system monitor.

When dynamic focus adjustment finishes, the system automatically resets the ProPalette and completes the final autoluma adjustment without any intervention from the operator.

3. Wait for the message "Saving data in flash" and "Writing deflection data," followed by the test status window indicating that the dynamic focus and final autoluma adjustments have been completed.
4. Remove the photosensor from the ProPalette unit.

Focusing the 35mm Camera

35mm camera focus first verifies that the 35mm camera performs its operations (load film, advance film, open shutter, etc.) upon command from the ProPalette digital board. It then precisely focuses the 35mm camera to match the CRT-to-film-plane distance for the particular combination of ProPalette and camera.

Required Tools and Equipment

- ProPalette Test Stand and associated fixtures
- RTV sealant
- Camera focus adjusting tool

Camera Functional Check

Use the following steps to verify proper operation of the 35mm camera back when installed on the ProPalette:

1. Connect the ProPalette to the Test Stand and power up the Test Stand as described on page 110.
2. Choose Start Test (press F1) to display the test menu (Figure 5-32).
3. Choose Camera Back Focus by pressing F6.

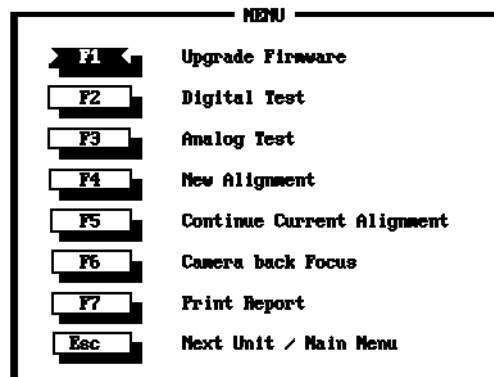


Figure 5-32. Test menu

4. Perform the following as directed by the instructions on the system monitor:
 - a. Install the camera on the ProPalette. Use the 35mm camera that belongs with the unit, **not** the standard 35mm camera.
 - b. Load film into the camera and close the camera cover.
 - c. Turn the ProPalette power switch to ON.
 - d. Watch the ProPalette LCD to verify that the correct firmware version is installed. If it is not, see "Upgrading ProPalette Firmware" on page 113.
 - e. Wait for the message, "Ready, Out of film" to appear on the ProPalette LCD.
5. Press the Enter key on the test system keyboard to display "Testing Camera Back."
6. Wait for the message indicating that the camera shutter is open and directing you to install the CCD camera block. This message indicates that the camera functional test has completed successfully.
7. Proceed to the following section to adjust camera focus.

Camera Focus Adjustment

Use the following procedure to adjust camera focus to match the particular CRT-to-film-plane distance for the ProPalette and 35mm camera combination.

1. Following instructions on the system monitor, open the 35mm camera and remove the film cartridge.
2. Insert the film plane camera into the camera back and hold it in place (Figure 5-33).

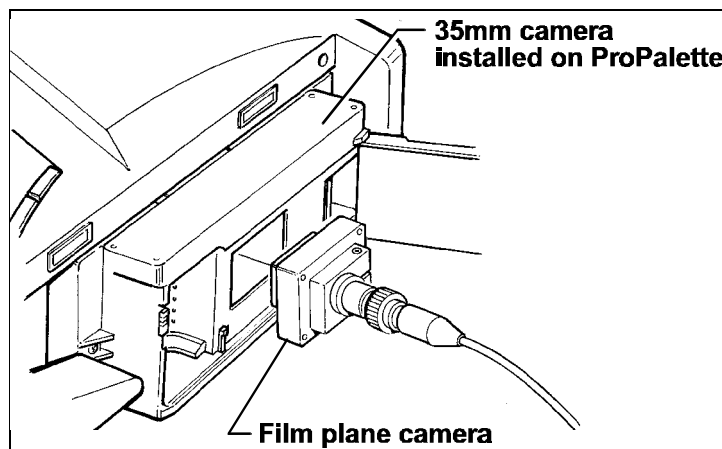


Figure 5-33. Installing film plane camera on 35mm camera back

3. Press the Enter key on the system keyboard.

The message "Adjust Image Brightness" appears on the system monitor and a focusing image (Figure 5-34) appears on the video monitor.

If a focusing image is not visible on the camera monitor or if it is too bright and poorly defined, use the Page Up, Page Down and arrow keys to adjust brightness. (Instructions are provided on the system monitor.) Wait 2 seconds after each adjustment to view its effect on the camera monitor.

4. Press the Enter key on the system keyboard to display the yellow area of interest box (Figure 5-35) on the video monitor.
5. Using the arrow keys, position the yellow area of interest box over the vertical lines on the left side of the focusing image (Figure 5-35).

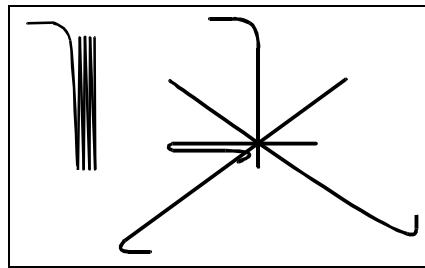


Figure 5-34. Focusing image on video monitor

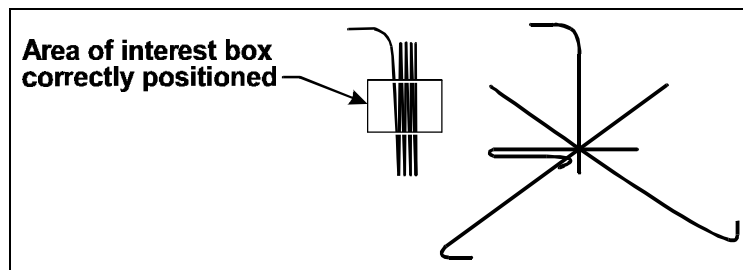


Figure 5-35. Area of interest box

6. Press the Enter key to display a yellow bar and numerical value on the system monitor (Figure 5-36).
7. Insert the camera focus adjusting tool through the adjusting port under the ProPalette unit and into the camera lens (Figure 5-37).
8. By turning the tool, adjust the lens position to minimize the index value displayed on the system monitor (Figure 5-36). Wait 2 seconds after each adjustment to view its effect.
9. Remove the adjustment tool and place a label over the adjusting port.
10. Press Enter to return to the test menu.

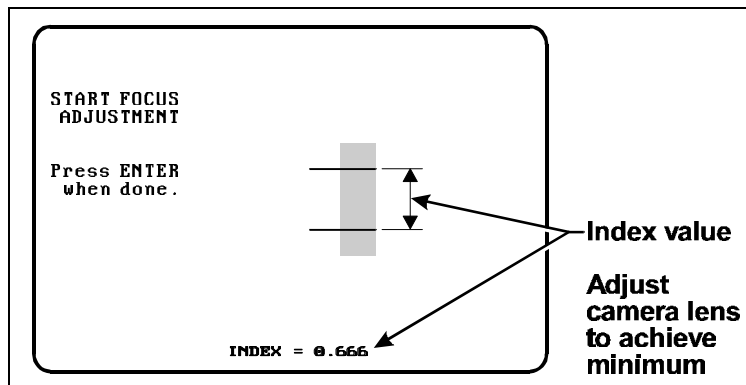


Figure 5-36. Index value displayed on system monitor

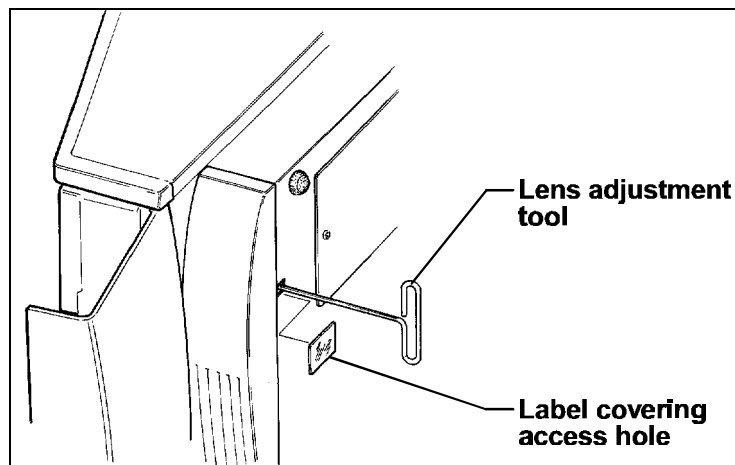


Figure 5-37. Inserting the lens adjusting tool

11. Turn the ProPalette power switch to OFF.
12. Disconnect the serial cable and the power cable.
13. Place a label over the serial connector.
14. Remove the 35mm camera from the ProPalette and apply a small amount of RTV adhesive to the lens adjustment screw to secure it.

6. Parts Replacement

Caution

To prevent electrostatic discharge to the electronics, technicians should be grounded using a wrist or heel strap before removing the covers of the Polaroid ProPalette 8000.

To avoid scratches to the covers, the Polaroid ProPalette 8000 should be disassembled on a work bench which has a soft, padded surface.

During disassembly, pay close attention to the manner in which cables are routed in the Polaroid ProPalette 8000. It will be necessary to route the cables in exactly the same locations when reassembling the unit. Failure to do this could cause damage to the wiring and result in a short. Additionally, to speed reassembly, you should make it a practice to label each cable as you disconnect it.

Note

Before disassembling the Polaroid ProPalette 8000, you must first disconnect all external cables and remove the camera from the unit.

Removal of the Front Bezel Assembly

1. Open the front bezel door.
2. Remove the four 8-32 x 3/8 screws which secure the Front Bezel Assembly to the Camera Plate Assembly. (Figure 6-1)
3. Pull the front bezel forward, lifting it slightly to release it from a lip on the pan.
4. Carefully lift the bezel away from the main unit, to the extent allowed by the cable.
5. Release the LCD Interface Cable from the LCD Keypad Assembly. (This is a keyed connector which can only be installed one way.)

The Front Bezel Assembly is now free of the unit.

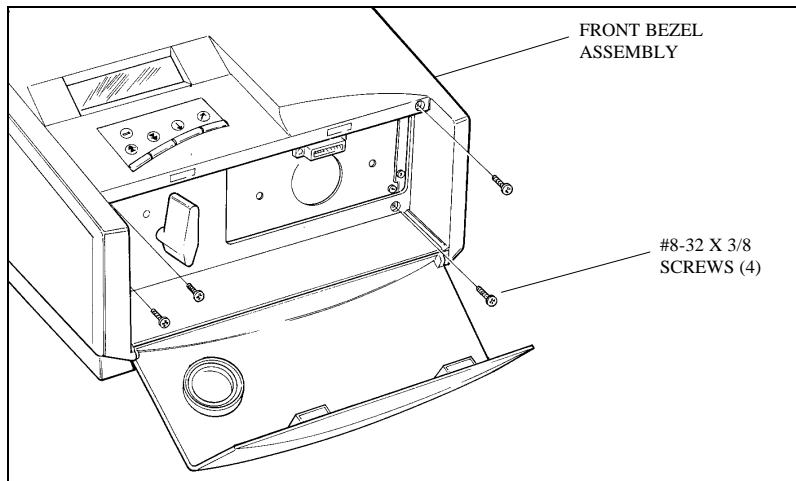


Figure 6-1. Removing the front bezel assembly

Installation of the Front Bezel Assembly

Reverse the steps above.

Note

Before installing the Front Bezel Assembly, slide the locking latch on the camera plate to the left and turn the locking knob on the bezel to the up position.

After sliding the front bezel onto the unit and before reinstalling the four screws which hold it to the pan assembly, reach into the camera opening to feel for the connector on the LCD Keypad Assembly. Be sure it is firmly seated and has not been jarred loose. Also, verify that the bezel and cover fit snugly together with no gaps in the area near the bottom of the unit

Removal of the LCD Keypad Assembly

1. Remove the Front Bezel Assembly.
2. Remove two #6-19 x 3/8 self-tapping screws which secure the LCD Keypad to the Front Bezel Assembly. (Figure 6-2)
3. Lift the keypad straight up and away from the front bezel.

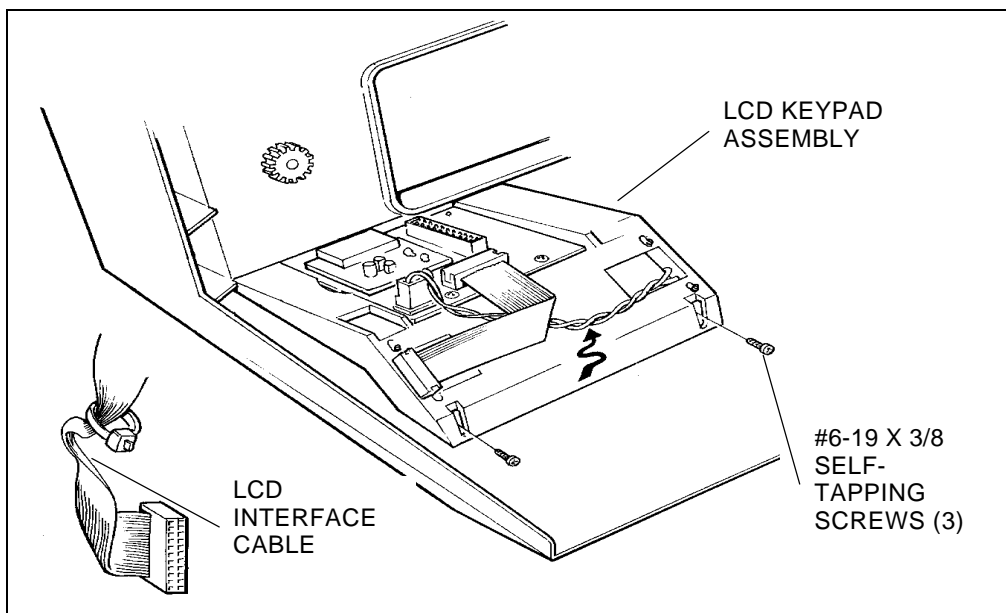


Figure 6-2. Removing the LCD keypad

Installation of the LCD Keypad Assembly

Reverse the steps above.

Note

New Keypad Assemblies have a protective film over the LCD window. Be sure to peel this film off before installing the unit. Also, when locating the Keypad Assembly on the Front Bezel Assembly, “jiggle” it slightly before installing the two screws to be sure it is properly seated. After installing the screws, examine the front bezel to be sure that the “fingers” are properly located in the slot of the bezel and not hung up under the bezel.

Removal of the LCD Panel

1. Remove the LCD Keypad assembly.
2. Disconnect the small harness connector on the back of the LCD Keypad Assembly.
(Figure 6-3)
3. Remove the four screws which hold the LCD Panel to the keypad assembly and lift the LCD panel and connected harness from the keypad assembly.

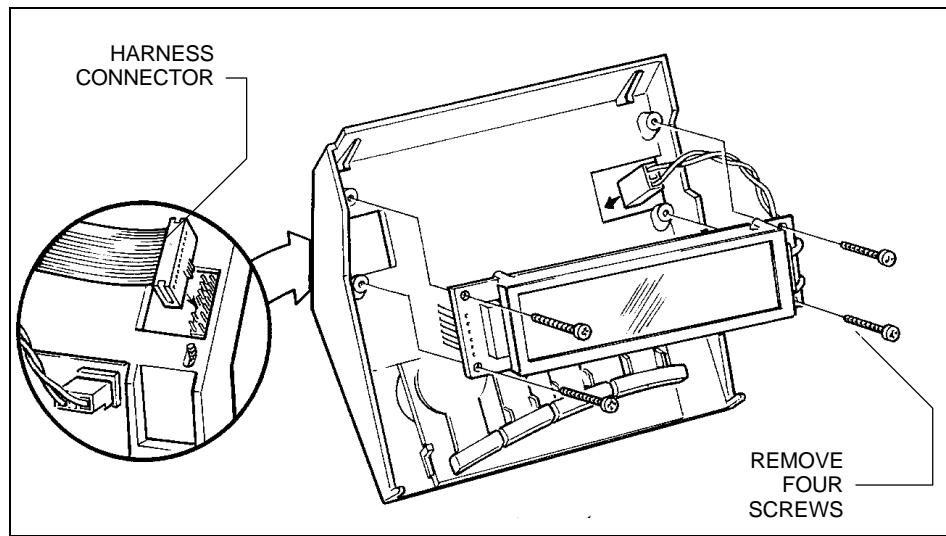


Figure 6-3. Removing the LCD panel

Installation of the LCD Panel

Reverse the steps above.

Note

If the new LCD panel has a protective film over the window, be sure to remove it before installation.

Removal of the Front Bezel Door

1. Open the Front Bezel Door.
2. Carefully, press down at the middle of the door (along the hinge line) to flex the plastic enough to allow one of the hinges to be released from its mating cavity in the bezel. (Figure 6-4)
3. Remove the bezel door.

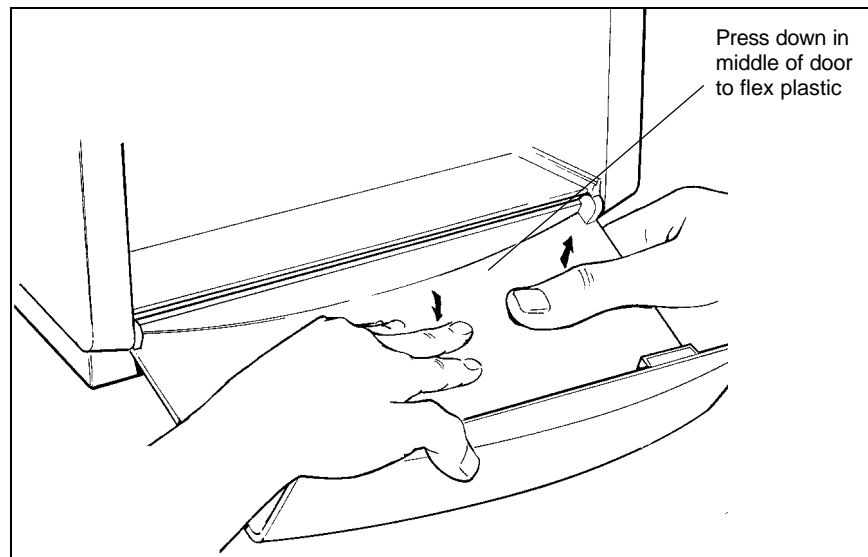


Figure 6-4. Removing the front bezel door

Installation of the Front Bezel Door

1. Place one of the door hinges into its mating bezel cavity.
2. Hold the door so the opposite hinge is next to its cavity; flex the middle of the door enough to allow the pin to enter the cavity.

Removal of the Power Switch

1. Remove the Front Bezel Assembly.
2. Using angled needle nose pliers, reach behind the switch and pull back each of the four wire connectors from the contacts on the switch. (Figure 6-5)
3. Squeeze the tabs behind the switch and push the switch forward to free it from the Camera Plate Assembly.

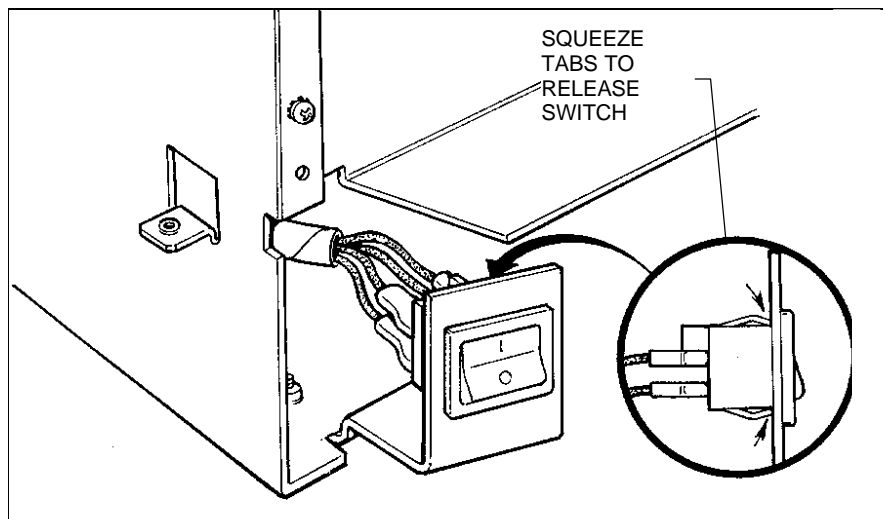


Figure 6-5. Removing the power switch

Installation of the Power Switch

1. Pull the four wires out slightly so they are protruding from the opening in the Camera Plate Assembly.
2. Push the four wire connectors onto their respective contacts on the new switch.
3. Push the switch and attached wires back through the opening until the tabs snap behind the plate.

Removal of the Camera Plate Assembly

1. Remove the Front Bezel Assembly.
2. Identify and remove four screws securing the Camera Plate Assembly to the Pan Assembly. (Figure 6-6)
3. Identify and remove five screws which hold the Camera Plate Assembly to the light box.
4. The camera plate is now held by locating pins (dimples?) between the pan frame assembly and the light box. Grasp one side of the pan frame and flex it outward to allow one side of the camera plate to be pulled out from behind the pan. Jockey the opposite side of the plate up and out from behind the pan assembly frame. (Use care to prevent damaging the cable assembly still attached to the plate.)

Note

If the camera plate is being removed to gain access to other components such as the stepper motor, autoluma board, or power switch, there is no need to remove the camera cable connector. Simply pull the panel forward to the extent of the slack in the cable and rest the panel on top of the unit with the cable still attached.

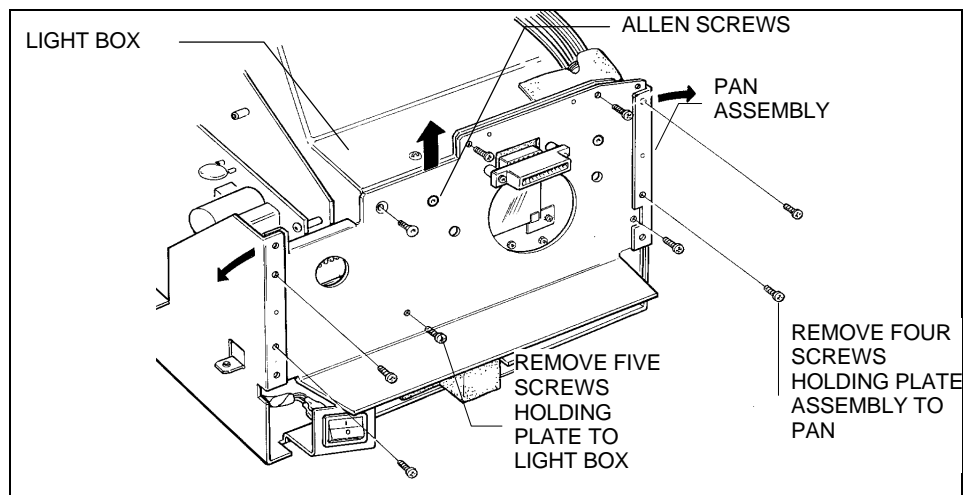


Figure 6-6. Removing the camera plate assembly

Installation of the Camera Plate Assembly

Reverse the steps above.

Note

If you are replacing the camera plate with a new one, examine the replacement to determine if the tapped openings for the large camera adapter are plugged with Allen screws. (These openings are to either side of the camera cable connector.) If the holes are not plugged, transfer the Allen screws from the old plate to the new one.

When you orient the camera plate between the pan assembly and the light box, you should hear the plate “pop” into place as it seats onto the locator pins. Be sure the plate is properly aligned on the pins before installing the securing screws. Also, be sure that no cables are pinched or are in the light path.

Removal of the Camera Cable (Teka) Connector

Note

The Camera Cable (TEKA) Connector is attached to the camera plate by two screws and standoffs. This connector actually serves as a female mating connector for the male connector on the cable which originates at the camera adapter assembly and for a male connector which is part of the camera cable terminating at the Digital PC Board.

1. Remove the Front Bezel.
2. Remove the Camera Plate Assembly.

3. Remove the Camera Cable (TEKA) Connector from the camera plate by removing two 4-40 x $\frac{3}{4}$ button hex head screws. Two standoffs behind the connector will be freed when the connector is released. Avoid losing them. (Figure 6-7)
4. Pull the connector with the attached cable forward slightly. Release the cable by very gently pulling its connector free at the back of the TEKA connector.

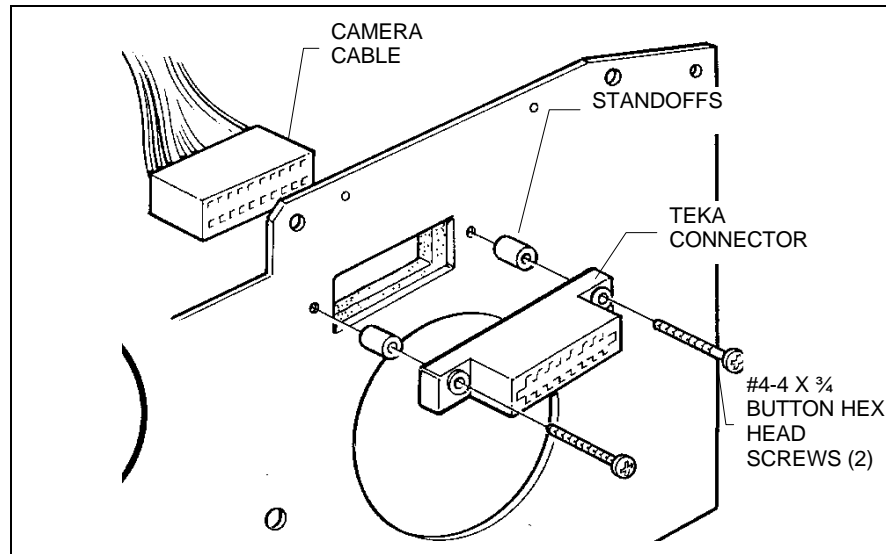


Figure 6-7. Removing the camera cable (TEKA) connector

Installation of the Camera Cable (Teka) Connector

Reverse the steps in the previous procedure.

Note

When assembling the camera cable into the TEKA connector, rock the cable slightly as it is being inserted. This helps to line up the cable contacts with their mating slots in the TEKA connector. When done, examine the TEKA connector to be certain that all the contacts are fully and firmly seated. Improperly aligned contacts will result in intermittent problems.

Removal of the Top Cover and Rear Panel Assembly

Note

For many of the removal procedures, it is not necessary to completely remove the top cover from the ProPalette 8000. After removing the securing hardware, simply slide the cover back far enough to gain access to the particular area of the unit you wish to service.

1. Turn the unit over, onto its top. (Figure 6-8)
2. Identify and remove ten 6-32 x ¼ Phillips Pan Head screws which secure the top cover to the pan tracks.
3. Identify and remove three 6-32 x ¼ Phillips Pan Head screws which secure the rear panel to the bottom of the pan.

Note:

Removal of the stepper motor, autoluma board, and wheel position sensor (photo interrupter) require that the access panel on the bottom of the unit be removed. While the unit is upside down, do this now by simply removing the two screws.

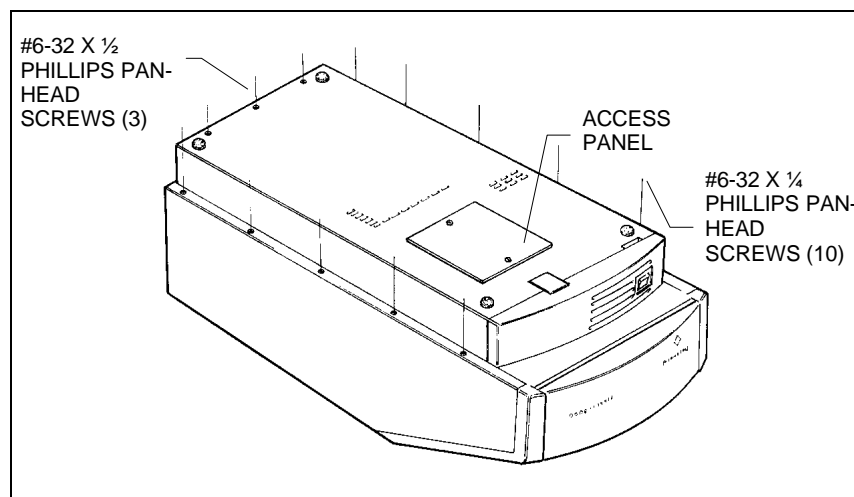


Figure 6-8. Removing the top cover

4. Return the unit to the right-side up position and remove three screws securing the SCSI connectors to the rear panel. (Figure 6-9)
5. Grasp the Top Cover and Rear Panel Assembly and firmly slide it back along the tracks and then lift it free.

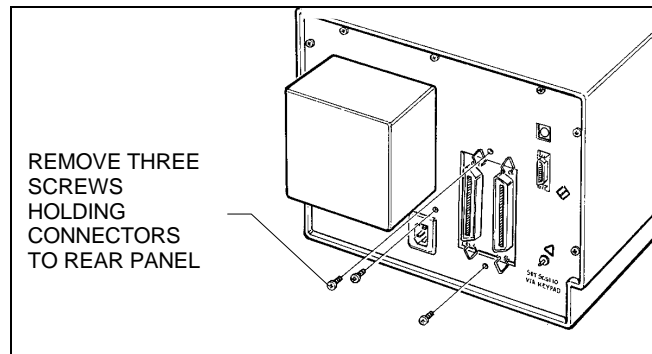


Figure 6-9. Removing the securing hardware from the rear panel

Installation of the Top Cover and Rear Panel Assembly

Reverse the steps above.

Note:

When sliding the assembly back into position, be sure that the SCSI and parallel port connectors are aligned with their respective openings in the rear panel. Do not reinstall the screws in the rear panel until you are sure that the connectors are properly seated.

Removal of the Stepper Motor

Note

This procedure covers removal of the stepper motor from the Front Plate Assembly. It does not cover the removal of the motor cable. The old motor cable is left in place until the new cable is ready to be installed. This allows you to lay the new motor cable alongside the old one during installation, insuring that cable routing and tie wrapping will accurately mimic the original version.

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Slide the Top Cover and Rear Panel Assembly back to reveal the PC boards.
5. Disconnect the spring from the stepper motor. (Figure 6-10)
6. The stepper motor is attached to a pivot post on the Front Panel. From the front of the unit, remove the #4-40 keps nut from the pivot post.
7. The stepper motor is now free of the front plate, but is still attached to its cable assembly which terminates at the Digital PC Board. To remove the motor and attached cable from the ProPalette, complete the procedure which follows.

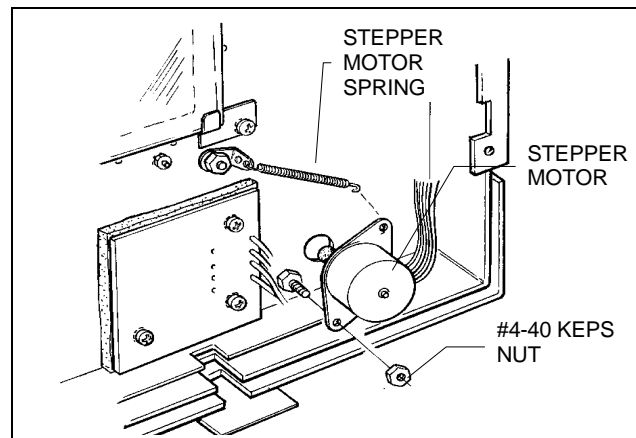


Figure 6-10. Removing the stepper motor

Installation of the Stepper Motor

With the old stepper motor still hanging from its cable, install the new stepper motor as follows.

1. Align the lower hole on the motor bracket over the pivot. Be sure the rubber wheel on the back of the stepper motor is located on the *outside* of the filter wheel. Secure the motor with the #4-40 keps nut.
2. Install the spring on the stepper motor.
3. Carefully peel back the self-adhesive light box seal at the top right corner of the Front Plate Assembly. (Figure 6-11) Fold it back far enough to expose the cables under it.
4. Identify the old stepper motor cable; lay the new stepper motor cable alongside it.
5. Disconnect the old stepper motor cable from its connector on the Digital PC Board.
6. Connect the new stepper motor cable to the PC board in place of the old cable.
7. Remove the old cable by freeing it from the tie wraps which secure it in place. As you cut each tie wrap, move the old cable aside and move the new cable into its place. Install a new tie wrap (in the same location of each old tie wrap) to secure the new cable.
8. Reverse steps 1 through 4 of the REMOVAL OF THE STEPPER MOTOR procedure.

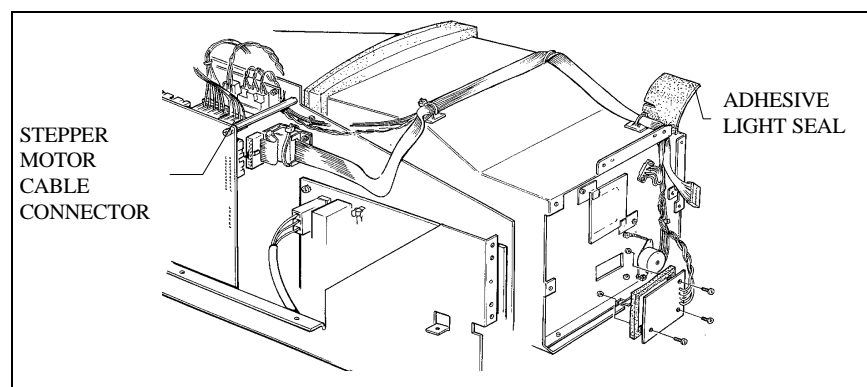


Figure 6-11. Removing the stepper motor cable

Removal of the Autoluma Board Assembly

Note:

This procedure covers removal of the autoluma board from the Front Panel Assembly, but does not cover its complete removal from the ProPalette 8000. Instead, the old autoluma board cable is left in place until the new autoluma board is ready to be installed. This allows you to lay the new autoluma cable alongside the old one during installation, insuring that cable routing and tie wrapping will accurately mimic the original version.

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Slide the Top Cover and Rear Panel Assembly back to reveal the PC boards.
5. Remove the three #6-32 x ½ keps screws which secure the Autoluma Board Assembly to the Front Panel. (Figure 6-12)
6. The autoluma board is now free of the front plate, but is still attached to the cable which terminates at the Digital PC Board. To completely remove the autoluma board and its attached cable from the ProPalette, complete the installation procedure which follows.

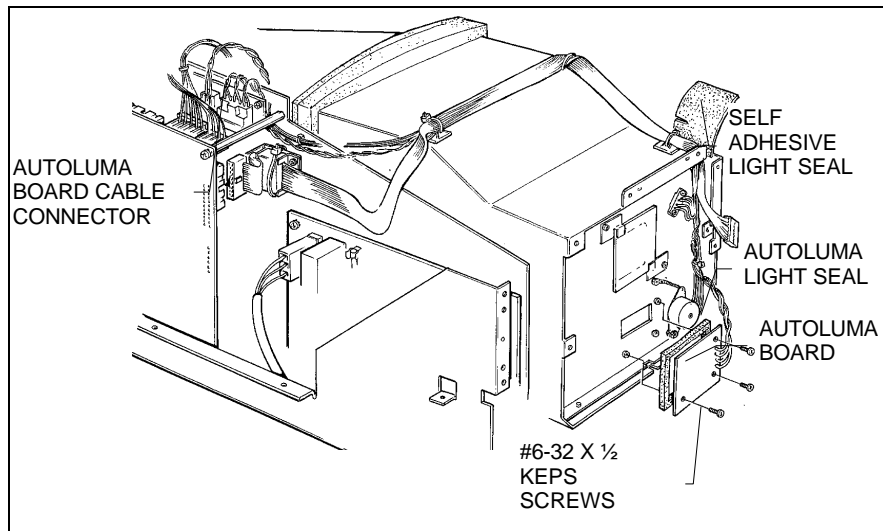


Figure 6-12. Removing the autoluma board

Installation of the Autoluma Board Assembly

With the old autoluma board still hanging from its cable, install the new autoluma board as follows.

1. Install a new self adhesive foam seal around the perimeter of the new autoluma board.
2. Align the autoluma board on the front panel and secure it using three 6-32 x ½ keps screws.
3. Carefully peel back the self-adhesive light box seal at the top right corner of the Front Panel Assembly. (Refer to Figure 6-12.) Fold it back far enough to expose the cables under it. Temporarily adhere the folded seal to the side of the unit.
4. Identify the old autoluma cable and lay the new autoluma cable alongside it.
5. Disconnect the old autoluma cable from the Digital PC Board.
6. Connect the new autoluma cable to the PC board in place of the old cable.
7. Remove the old cable by freeing it from the tie wraps which secure it in place. As you cut each tie wrap, move the old cable aside and move the new cable into its place. Install a new tie wrap (in the same location of each old tie wrap) to secure the new cable.
8. Remove the old autoluma board with attached cable from the ProPalette.
9. Reverse steps 1 through 4 of the REMOVAL OF THE AUTOLUMA BOARD ASSEMBLY PROCEDURE.

Removal of the Wheel Position Sensor (Photo Interrupter)

Note

This procedure covers removal of the Wheel Position Sensor (Photo Interrupter) from the Front Panel Assembly, but does not cover its complete removal from the ProPalette 8000. Instead, the old sensor cable is left in place until the new Wheel Position Sensor is ready to be installed. This allows the technician to lay the new sensor cable alongside the old one during installation, insuring that cable routing and tie wrapping will accurately mimic the original version.

1. Remove the Front Bezel Assembly.

2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Slide the Top Cover and Rear Panel Assembly back to reveal the PC boards.
5. Drill out the two rivets which secure the Wheel Position Sensor to the Front Panel.
(Figure 6-13)

Caution

Be certain that all debris from the drilling is removed from the unit. This includes debris that may be located at the base of the front panel on the outside and debris that may be located in the access panel area.

6. The sensor is now free of the front plate, but is still attached to the cable assembly which terminates at the Digital PC Board. To completely remove the sensor and cable, complete the installation procedure which follows.

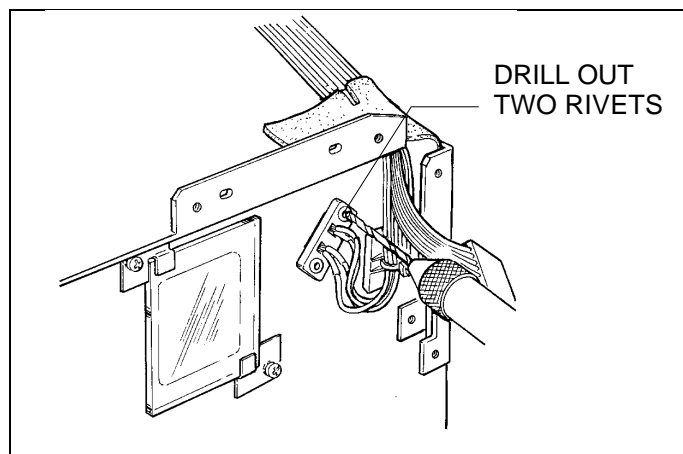


Figure 6-13. Removing the wheel position sensor

Installation of the Wheel Position Sensor (Photo Interrupter)

With the old wheel position sensor still hanging from its cable, install the new sensor as follows.

1. Align the new Wheel Position Sensor onto the Front Panel and secure it with two rivets.
2. Carefully peel back the self-adhesive light box seal at the top right corner of the Front Panel Assembly. Fold it back far enough to expose the cables under it. (Figure 6-14)
3. Identify the old wheel sensor cable and lay the new sensor cable alongside it.
4. Disconnect the old wheel position sensor cable from the Digital PC Board.
5. Connect the new sensor cable to the PC board in place of the old cable.
6. Remove the old cable by freeing it from the tie wraps which secure it in place. As you cut each tie wrap, move the old cable aside and move the new cable into its place. Install a new tie wrap (in the same location of each old tie wrap) to secure the new cable.
7. Remove the old wheel position sensor with attached cable from the ProPalette.
8. Reverse steps 1 through 4 of the REMOVAL OF THE WHEEL POSITION SENSOR (PHOTO INTERRUPTER) procedure.

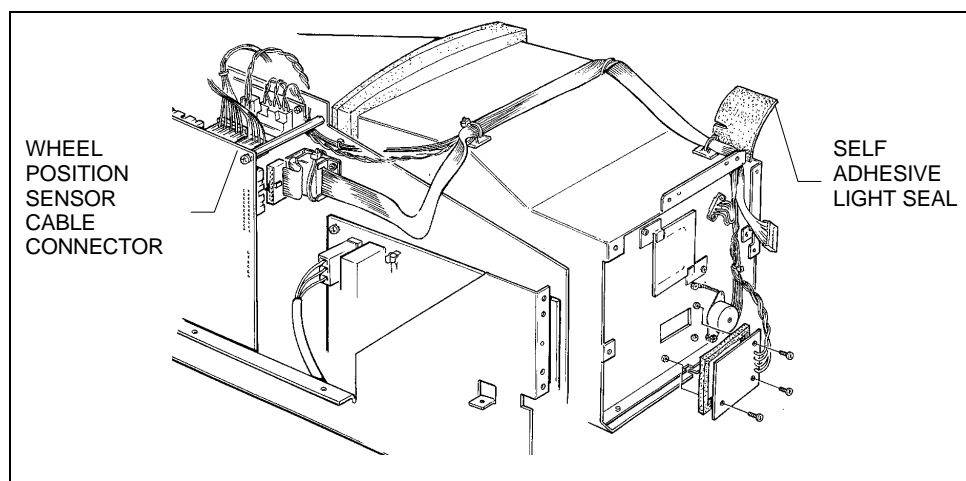


Figure 6-14. Removing the wheel position sensor cable

Removal/Installation Of The LCD Interface Cable

1. Remove the Front Bezel Assembly.
2. Slide the Top Cover and Rear Panel Assembly back to reveal the PC boards.
3. Lay the new LCD Interface Cable next to the LCD cable in the ProPalette.
4. Disconnect the old LCD cable from the Digital PC Board.
5. Insert the connector of the new cable onto the PC board.
6. Remove the screw that secures the standoff between the two pc boards. (Figure 6-15)
7. Remove the old LCD cable by sliding the tie wrap off the standoff.
8. Secure the new cable to the standoff with a tie wrap.

CAUTION

Be sure the cable is pulled taut over the power supply area. The cable should not be allowed to contact any part of the power supply.

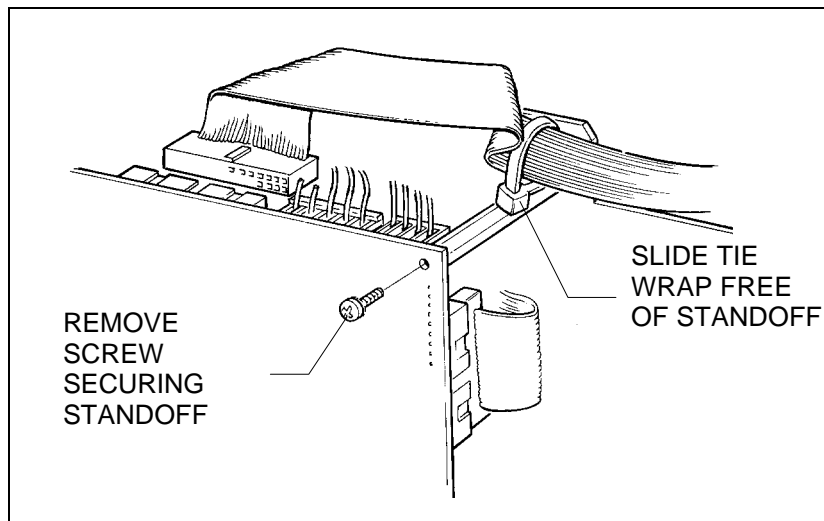


Figure 6-15. Freeing the LCD cable

Removal/Installation of the Camera Cable Assembly

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.

3. Remove The Camera Cable (TEKA) Connector.
4. Slide the Top Cover and Rear Panel Assembly back to reveal the PC boards.
5. Carefully peel back the self-adhesive light box seal at the top right corner of the Front Panel Assembly. Fold it back far enough to expose the cables under it. (Figure 6-16)
6. Lay in the new Camera Cable Assembly next to the old one.
7. Disconnect the camera cable from the Digital PC Board.
8. Connect the new camera cable to the Digital PC Board. (Note that the new cable has an attached ferrule.)
9. Cut the tie wrap securing the old cable ferrule to the electronics drawer and all other tie wraps holding the cable in place and remove the old cable.
10. Secure the new camera cable ferrule to the side of the electronics drawer with a tie wrap, in the same manner as the old cable and install tie wraps to secure the new cable in the same locations as the tie wraps just removed.
11. Reverse steps 1 through 5 above.

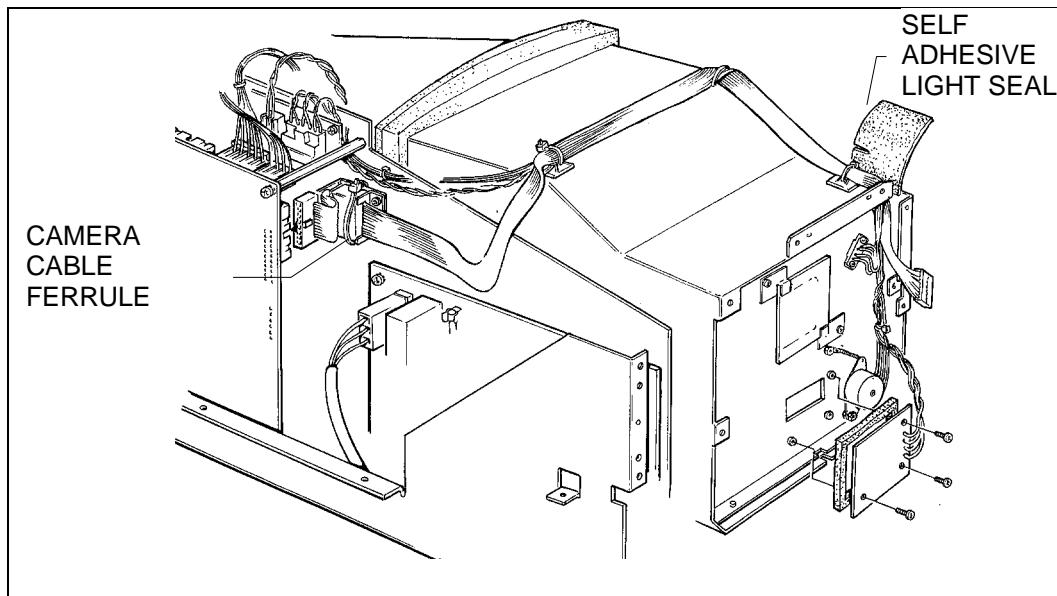


Figure 6-16. Removing the camera cable assembly

Removal of the Electronics Drawer

1. Remove the Top Cover and Rear Panel Assembly from the ProPalette.
2. Disconnect the following connectors from the PC boards: (Figure 6-17)

<i>Digital PC Board:</i>	<i>Analog PC Board:</i>	<i>Low Voltage Power Supply</i>
J12 -LCD Interface Cable J13 -Camera Cable J5 -Stepper Motor Cable J6 -Wheel Position Sensor Cable	J35 -Autoluma Board Cable J33 & J34 -High Voltage Power Supply Cables (2) J37 -Yoke Assembly Cable J38 -Video	Power switch cable

3. Remove the screw holding the Digital PC Board to the top standoff and slide the LCD cable tie wrap off the standoff.
4. Cut the tie wrap which secures the camera cable ferrule to the drawer and move the cable aside.

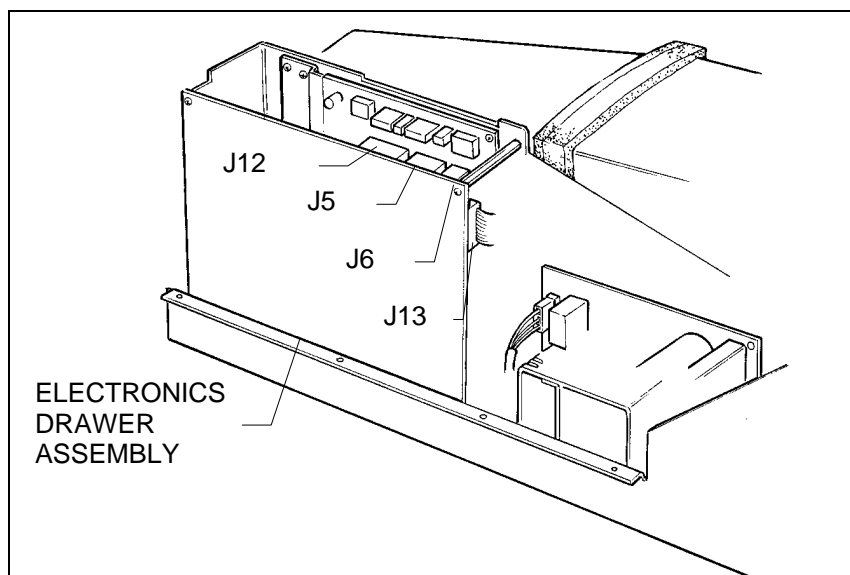


Figure 6-17. Removal of electronics drawer

5. Turn the unit on its side and remove two screws at the base securing the drawer to the pan assembly (Figure 6-18). Turn the unit right side up again.
6. Using a long, magnetic Phillips screwdriver, remove the #6-32 x 1/2 screw from the interior of the unit (at the base, between the PC boards and the low voltage power supply) which holds the electronics drawer to the pan.
7. Lift the electronics drawer slightly to release it from its locating pin and then slide it up and toward the rear to remove it from the unit.

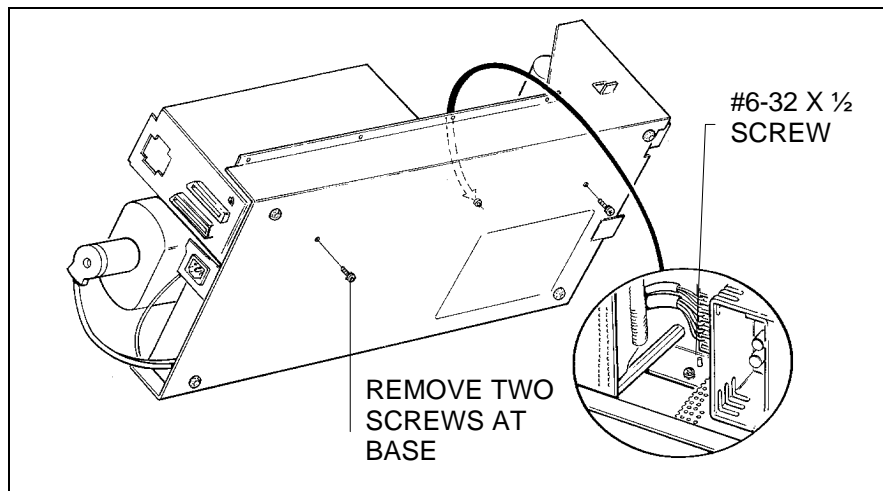


Figure 6-18. Removing the electronics drawer hardware

Installation of the Electronics Drawer

Reverse the steps above.

Note

When positioning the drawer back into the ProPalette 8000, be sure the locating pin on the base of the unit engages the hole in the drawer assembly before installing the securing hardware.

Removal of the Digital PC Board Assembly

1. Remove the Top Cover and Rear Panel Assembly.
2. Remove the Electronics Drawer.
3. Remove four screws holding the Digital PC Board to the drawer assembly.
(Figure 6-19)
4. Remove two screws holding the parallel port connector to the drawer.
5. Disconnect the large connector from the Analog PC Board.

The board is now free of the drawer assembly.

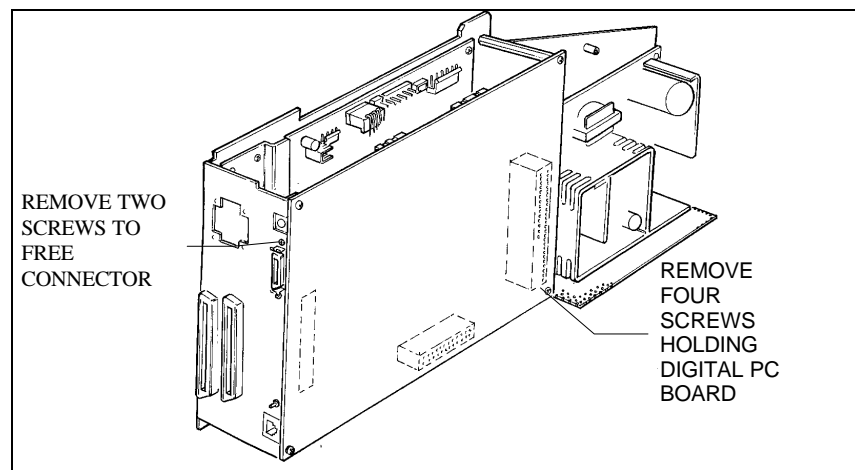


Figure 6-19. Removing the digital pc board assembly

Installation of the Digital PC Board Assembly

Reverse the steps above.

Replacement of the Camera Power Fuse

To replace the camera power fuse on the Digital PC Board, you must remove the Digital Board as described in the previous section. Inspect the bayonet-type fuse, replace it if necessary, and reinstall the Digital Board in the ProPalette.

Removal of the Analog PC Board

1. Remove the Top Cover and Rear Panel Assembly.
2. Remove the Electronics Drawer.
3. Disconnect the large connector between the digital and analog boards.
4. Remove the Digital PC Board.
5. Disconnect the remaining cables on the analog board. (These cables all originate at the low voltage power supply. (Figure 6-20)
6. Remove seven screws holding the Analog PC Board in place: five at the heat sink pad and two at the forward end, holding the board to the drawer
7. The board is now free of the drawer assembly.

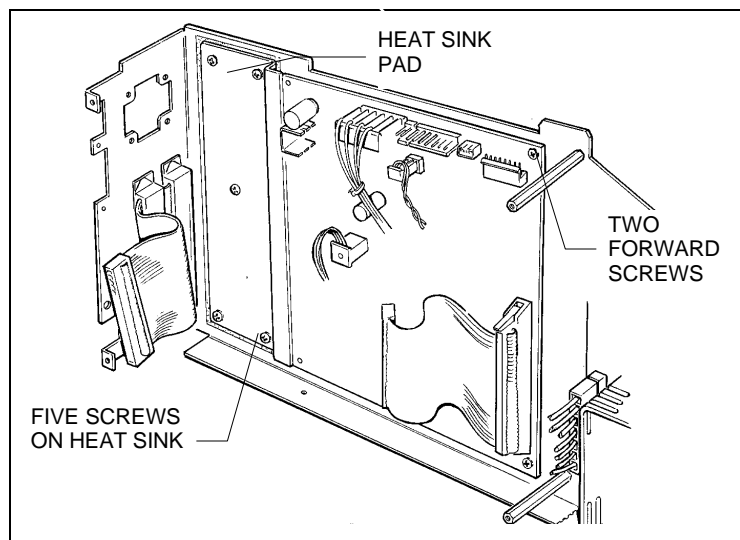


Figure 6-20. Removing the analog pc board assembly

Installation of the Analog PC Board

Reverse the steps above.

Removal of the Low Voltage Power Supply

1. Remove the Top Cover and Rear Panel Assembly.

Note

The Low Voltage Power Supply Fuse is accessible without requiring further disassembly.

2. Remove the Electronics Drawer
3. Disconnect the low voltage cables from the Analog PC Board.
4. Remove four screws which secure the low voltage supply to the drawer. (Figure 6-21)
5. Remove the power supply safety shield and hardware (two 6-32 x 3/8 screws and standoffs) for transfer to the new power supply.

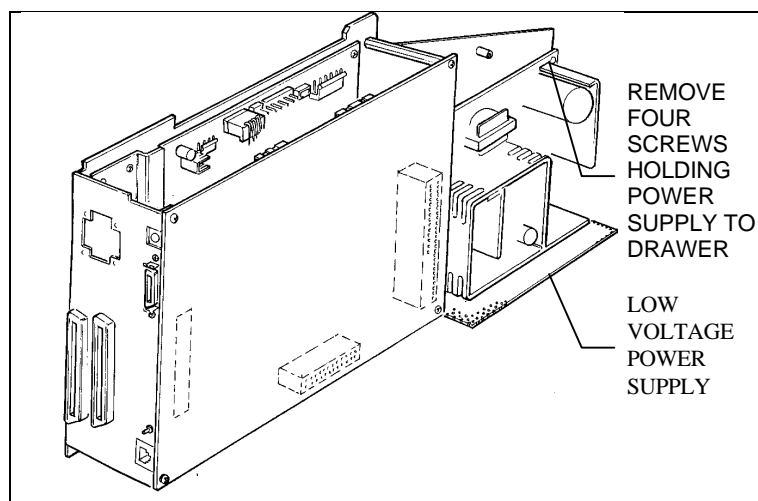


Figure 6-21. Removing the low voltage power supply

Installation of the Low Voltage Power Supply

Reverse the steps above.

Removal of the Light Box Assembly

Note

The CRT and Light Box are provided as a calibrated assembly.
They are not to be separated.

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Remove the Top Cover and Rear Panel Assembly.
5. Carefully peel back the self-adhesive light box seal at the top right corner of the Front Plate Assembly. Fold it back far enough to expose the cables under it. (Figure 6-22)
6. Cut the tie wraps in the two areas where they hold the wiring cables to the top of the light box assembly.
7. The stepper motor cable, the wheel position sensor cable, and the autoluma board cable are laced together in a harness going to the electronics drawer. Disconnect the first two from the digital PC board and the autoluma cable from the analog PC board and pull the cables forward over the front plate.
8. Disconnect the High Voltage Power Supply Cables (2), the Yoke Assembly Cable, and the Video Cable from the analog board.

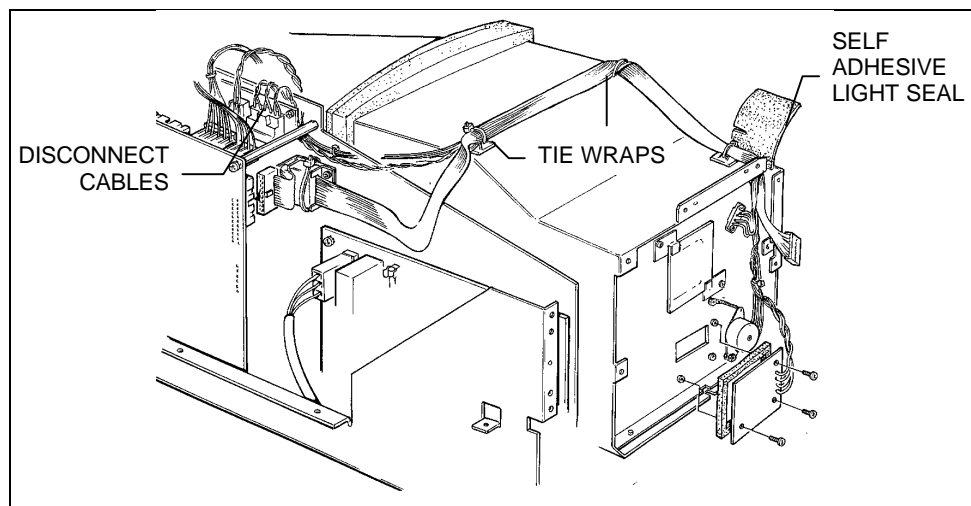


Figure 6-22. Preparing for Light Box Removal

9. Turn the unit on its side and identify and remove the two screws at either side of the access area (Figure 6-23). There are o-rings around the screws, inside the unit. When you remove the screws, these o-rings will fall loose, but, they can be retrieved when the light box is removed.
10. Disconnect the round connector and attached wires from the base of the CRT.
11. Disconnect the two stop nuts which secure the top of the metal shield to the light box. One of these nuts also holds a ground strap. Move the strap aside.
12. Remove the screw holding a cable ground at the narrow end of the metal shield
13. Reach into the opening at the end of the metal shield and pry out the foam seal.
14. Slide the rubber grommet and enclosed cables free of the shield.

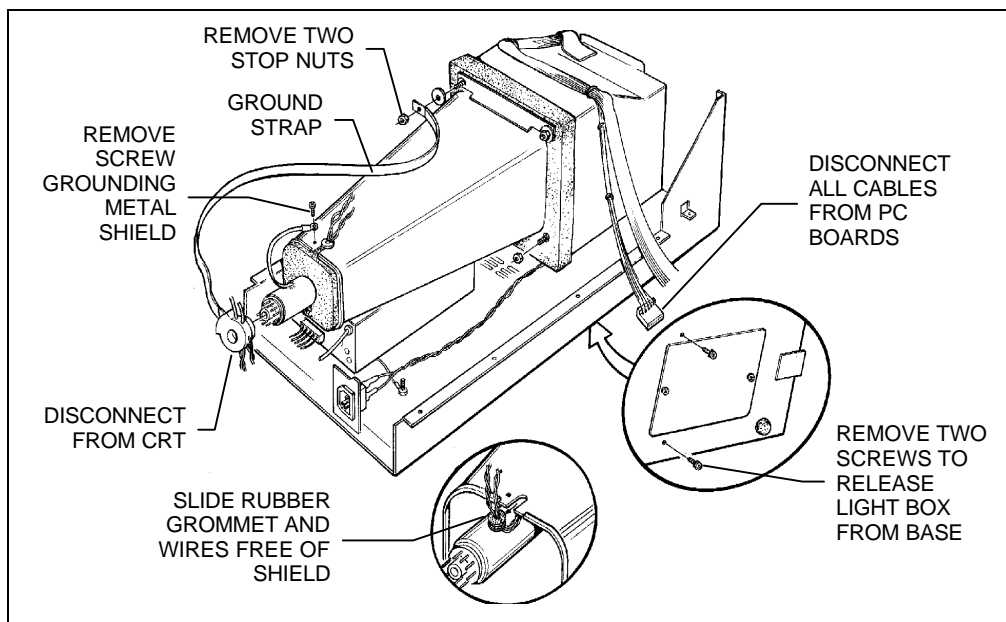


Figure 6-23. Releasing the Light box from the Base

15. Pull the metal shield down the CRT far enough to reveal the rubber-enclosed high voltage lead going into the CRT (Figure 6-24). Pry off the rubber gasket to free the lead and pull the lead down through the opening at the end of the shield. (Figure 6-23)
16. Guide the metal shield down the length of the CRT and remove it from the assembly.
17. The Light Box Assembly, with the attached Front Plate, may now be removed from the unit.

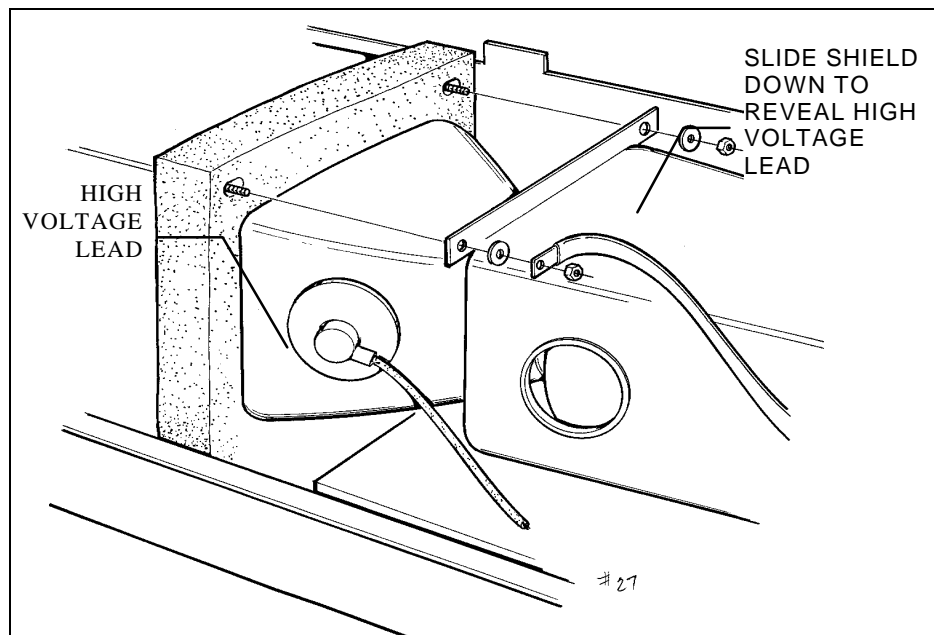


Figure 6-24. Disconnecting the High Voltage Lead

Installation of the Light Box Assembly

1. Orient the Light Box Assembly with the attached Front Plate onto the unit. Be certain that the power cable is not crimped under the assembly.
2. Before the Light Box Assembly is secured in position, install the Camera Plate Assembly onto the Front Plate Assembly using five screws. (Snake the cables through the slot in the front plate.)
3. Now pull the camera plate forward, snugly behind the 90 degree angles of the pan assembly. Secure it using four screws. (This will properly align the Front Plate and Light Box Assembly in the unit.)

4. Tie wrap the cables in the same locations on top of the light box as the wraps removed during removal. Adhere the light box seal over the cables.
5. Connect all cables to their proper termination jacks on the pc boards.
6. Install the Front Bezel Assembly.
7. Install the small mu metal shield onto the CRT.
8. Install the round connector on the base of the CRT. Pull the mu metal shield back, against the round connector.
9. Install the high voltage rubber-encased lead into the CRT.
10. Install all the CRT cables onto the appropriate termination points on the pc boards.
11. Turn the unit on its side and install the two screws through the pan and into the light box. The use of a special tool (# ----) is required to hold the rubber o-rings in place while the screws are being inserted. (Figure 6-25)

AT THIS POINT, THE CRT ALIGNMENT PROCEDURE MUST BE DONE.

12. When the alignment procedure is complete and the yoke is hot melted in place, remove the high voltage lead from the CRT, disconnect the round connector and disconnect the CRT cables from the pc boards.

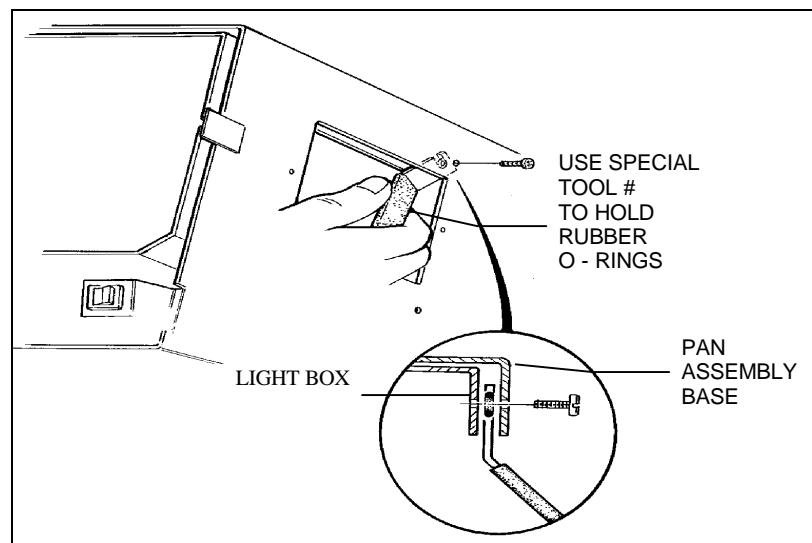


Figure 6-25. Installing the Rubber O-Rings

13. Position the large metal shield part way over the CRT, feeding the yoke wires through the shield and out the small end. Reach into the large end of the shield to grab the high voltage wire and install it into the CRT. Push the shield forward, fully onto the threaded shafts.
14. Pull the yoke cables with their rubber grommet into the slot in the shield. Insert the cable connectors into their respective termination points on the pc boards.
15. Place the large ground strap over the shaft at the left side of the shield and secure it with the stop nut.
16. Install the second stop nut to secure the right side of the shield.
17. Insert the foam seal into the opening in the shield.
18. Install the screw to secure the small ground wire to the metal shield. (next to the rubber grommet.)
19. Install the round connector to the base of the CRT.
20. Install the Top Cover and Rear Panel Assembly.
21. Install the Access Panel.

Disassembly of the CRT

1. Slightly twist and remove the round mu metal shield from the tube. (This shield has a ground cable and tie wrap attached, which should be left in place.) Some hot melt adhesive will be left in the shield. Remove the hot melt inside the shield. (Figure 6-26)
2. Loosen the metal clamp that holds the yoke in position on the CRT. (The yoke is also held with hot melt adhesive.)
3. Firmly twist the yoke to break the hot melt and remove the yoke from the tube. Remove the hot melt from the inside yoke surface.
4. Remove the wide electrical tape wrapped around the glass tube. This tape serves as a gripping surface where the yoke clamp is located.

This is the limit of CRT disassembly.

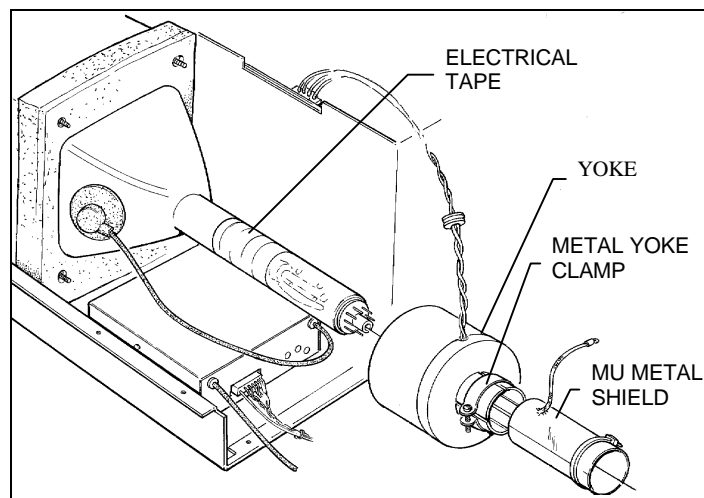


Figure 6-26. Disassembling the CRT

Reassembly of the CRT

1. Wrap a strip of wide electrical tape around the area of the CRT where the yoke clamp will be installed. (The tape should overlap the clear area of the tube by about a ½ inch.)
2. Install the yoke over the CRT and lightly secure it using the metal clamp. DO NOT tighten too firmly.

Note

After CRT alignment, a small amount of hot melt adhesive will be applied between the forward portion of the yoke and the CRT.

3. Install the small mu metal shield over the end of the CRT.
4. Apply a small amount of hot melt adhesive under the forward portion of the shield.

Removal of the Front Plate Assembly

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Remove the Top Cover and Rear Panel Assembly.
5. Remove the Light Box Assembly.

6. Remove eight #6-32 x ¼ screws (two at the top, two at each side, two at the bottom) which secure the Front Panel Assembly to the light box (Figure 6-27). Friction now holds the front panel in place.
7. Push in one side of the front plate to dislodge it from the light box. Pull the plate free of the light box.

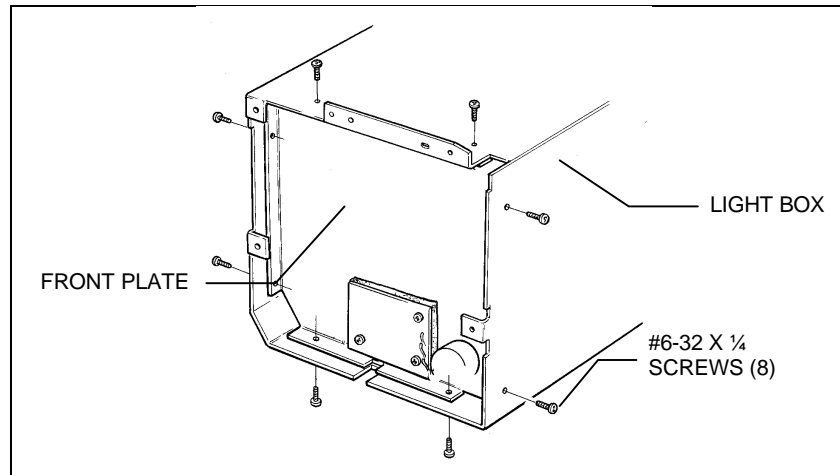


Figure 6-27. Removing Front Plate from Light Box

Installation of the Front Plate Assembly

Reverse the steps above.

Note

When reinstalling the front plate, note that one corner does not form a 90 degree angle. This corner matches a similar corner on the light box. Slide the panel into the light box and reach in from the access cutout to align the plate screw holes with the screw holes in the light box. Be careful to push on the plate and not on the filter wheel when doing this.

Removal of the Filter Wheel

1. Remove the Front Bezel Assembly.
2. Remove the Camera Plate Assembly.
3. Remove the Access Panel.
4. Remove the Top Cover and Rear Panel Assembly.
5. Remove the CRT Assembly
6. Remove the Front Plate Assembly.
7. Remove two screws which hold the filter wheel blinder in place. (Figure 6-28)
8. Remove the e-ring holding the wheel on the shaft and lift off the filter wheel.

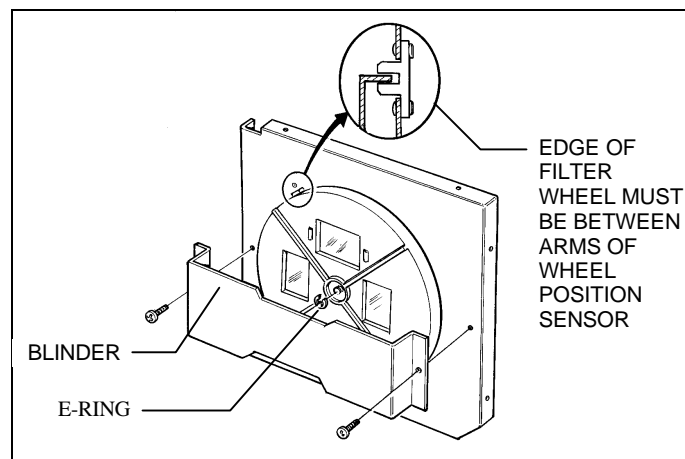


Figure 6-28. Removing the Filter Wheel

Installation of the Filter Wheel

Reverse the steps above.

Note

Be sure the edge of the filter wheel is positioned **between** the arms of the wheel position sensor when you place the wheel back on its shaft. Also, after installing the e-ring and the blinder, spin the wheel on the shaft to be certain it is not binding anywhere.

Replacement of the Filters

Use the procedure below to replace individual filters on the ProPalette filter wheel without removing the front bezel or top cover.

Required Materials and Equipment

- Short Phillips-head screwdriver
- Cotton gloves
- Snap-ring removal tool or small pliers
- Anti-static mat and wrist strap

Filter-Replacement Procedure

1. Turn the ProPalette unit on its side and remove the bottom access door (Figure 6-29).
2. Reach inside the compartment with the short Phillips-head screwdriver to remove the filter wheel blinder (Figure 6-30).
3. Use the snap-ring removal tool or small pliers to remove the filter wheel snap ring (Figure 6-30), and remove the filter wheel from its pivot.

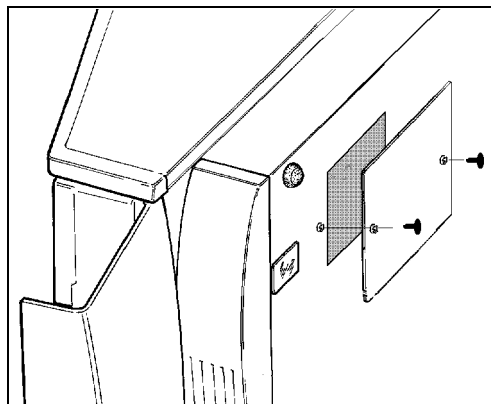


Figure 6-29. Removing the bottom access door

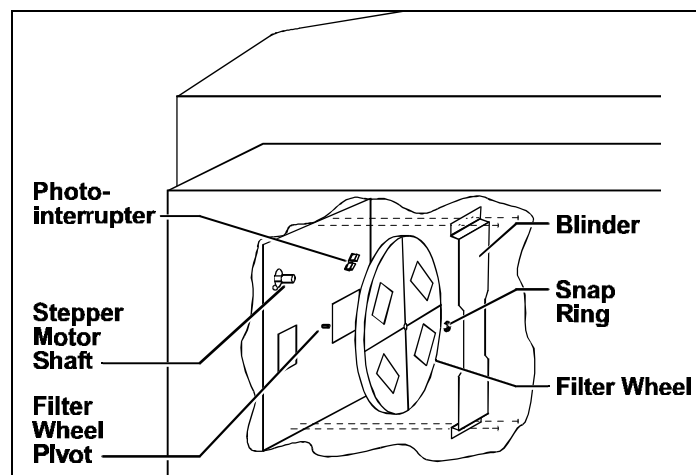


Figure 6-30. Removing the filter wheel from its pivot

4. Without removing the filter wheel from the compartment, locate the red filter by observing the filter names printed on the filter wheel.

Note

Upon direct observation, the red filter does **not appear to be red** in color. The filter name indicates the color observed when a white light is viewed through it.

Caution

Be sure to wear white cotton gloves when working inside the compartment to avoid fingerprints on the filters and CRT face.

5. Press one of the filter retaining tabs to release the filter (Figure 6-31) and lift the filter out of the wheel.
6. Insert the replacement filter in the wheel by pressing the tab, positioning the new filter, and releasing the tab.
7. Pivot the spring-mounted stepper motor shaft away from the filter wheel pivot, mount the filter wheel back on the pivot, and release the stepper motor shaft so it contacts the outside of the filter wheel. **Be sure the filter wheel lip is located in the photo-interrupter slot** (Figure 6-30).
8. Reinstall the filter wheel snap ring on the pivot shaft.
9. Pivot the stepper motor shaft away from the filter wheel and verify that the wheel rotates freely.
10. Clean the filters.
11. Reinstall the filter wheel blinder.
12. Clean the CRT face.
13. Reinstall the bottom access door.

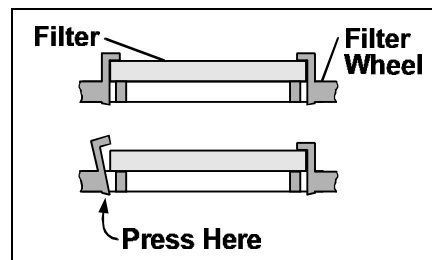


Figure 6-31. Removing a filter from the wheel

Removal of the High Voltage Power Supply

1. Remove the Top Cover and Rear Panel Assembly.
2. Turn the unit on its side and identify and remove four screws which hold the High Voltage Power Supply to the Pan Assembly. Use care since the power supply will shift once the last screw is removed. (Figure 6-32)
3. Slide the power supply out from under the CRT.
4. Remove the connector from the power supply.
5. Disconnect the fuse holder.
6. Remove the large metal shield and disconnect the cables from the power supply at their termination points.
7. The power supply is now free.

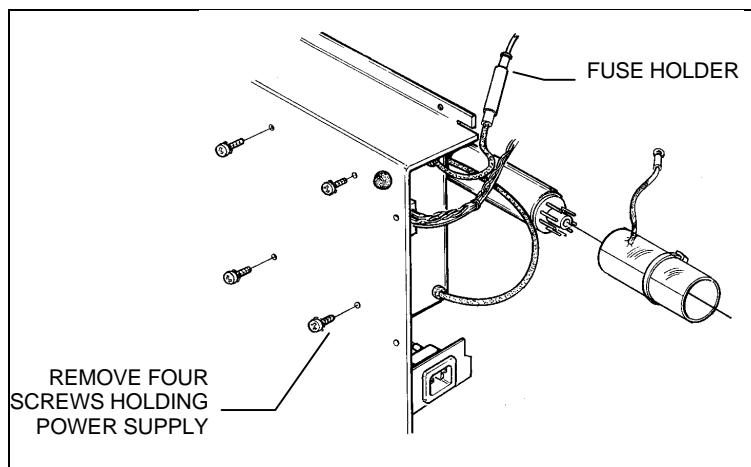


Figure 6-32. Removing the High Voltage Power Supply

Installation of the High Voltage Power Supply

Reverse the steps in the removal procedure above.

7. Schematics

This chapter contains the following ProPalette schematic diagrams for use in troubleshooting:

<i>Schematic</i>	<i>Figure</i>	<i>Page</i>
Interconnection diagram	7-1	176
Digital board, sheet 1 of 9	7-2	177
Digital board, sheet 2 of 9	7-3	178
Digital board, sheet 3 of 9	7-4	179
Digital board, sheet 4 of 9	7-5	180
Digital board, sheet 5 of 9	7-6	181
Digital board, sheet 6 of 9	7-7	182
Digital board, sheet 7 of 9	7-8	183
Digital board, sheet 8 of 9	7-9	184
Digital board, sheet 9 of 9	7-10	185
Analog board, sheet 1 of 5	7-11	186
Analog board, sheet 2 of 5	7-12	187
Analog board, sheet 3 of 5	7-13	188
Analog board, sheet 4 of 5	7-14	189
Analog board, sheet 5 of 5	7-15	190
Autoluma board	7-16	191
Keypad board	7-17	192
Power Fail Fix	7-18	193

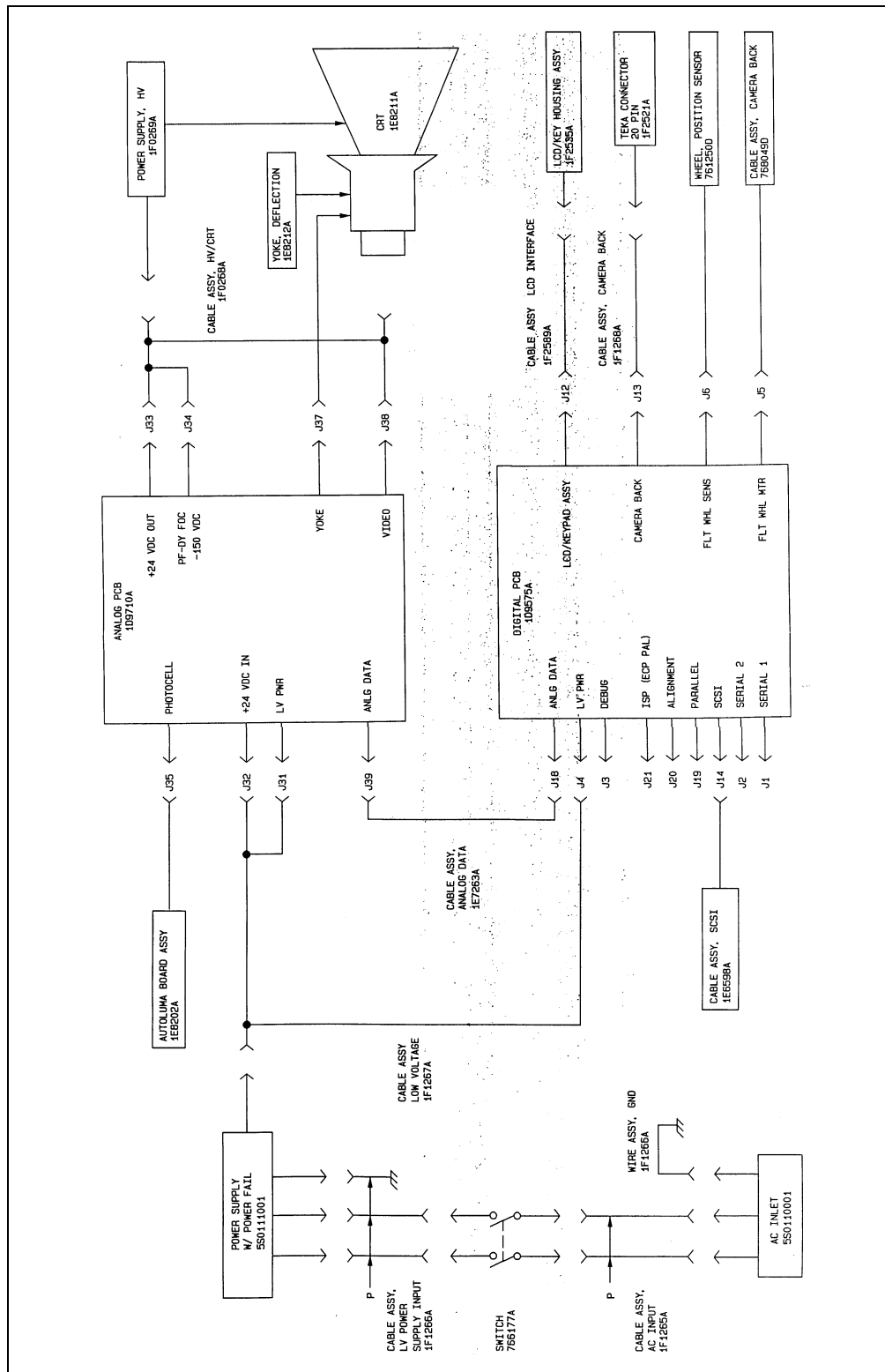


Figure 7-1. Interconnection diagram

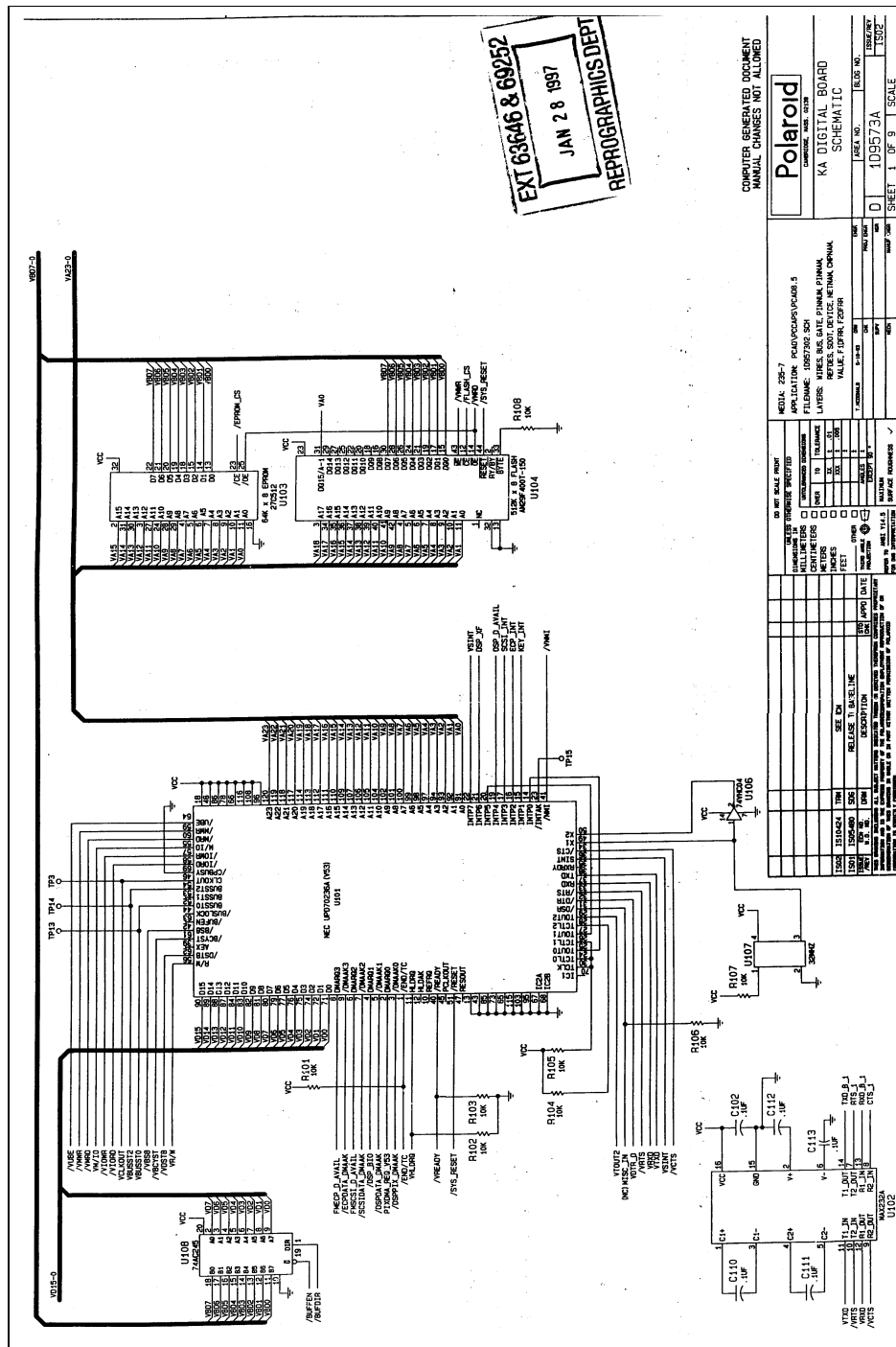


Figure 7-2. Digital Board schematic, Sheet 1 of 9

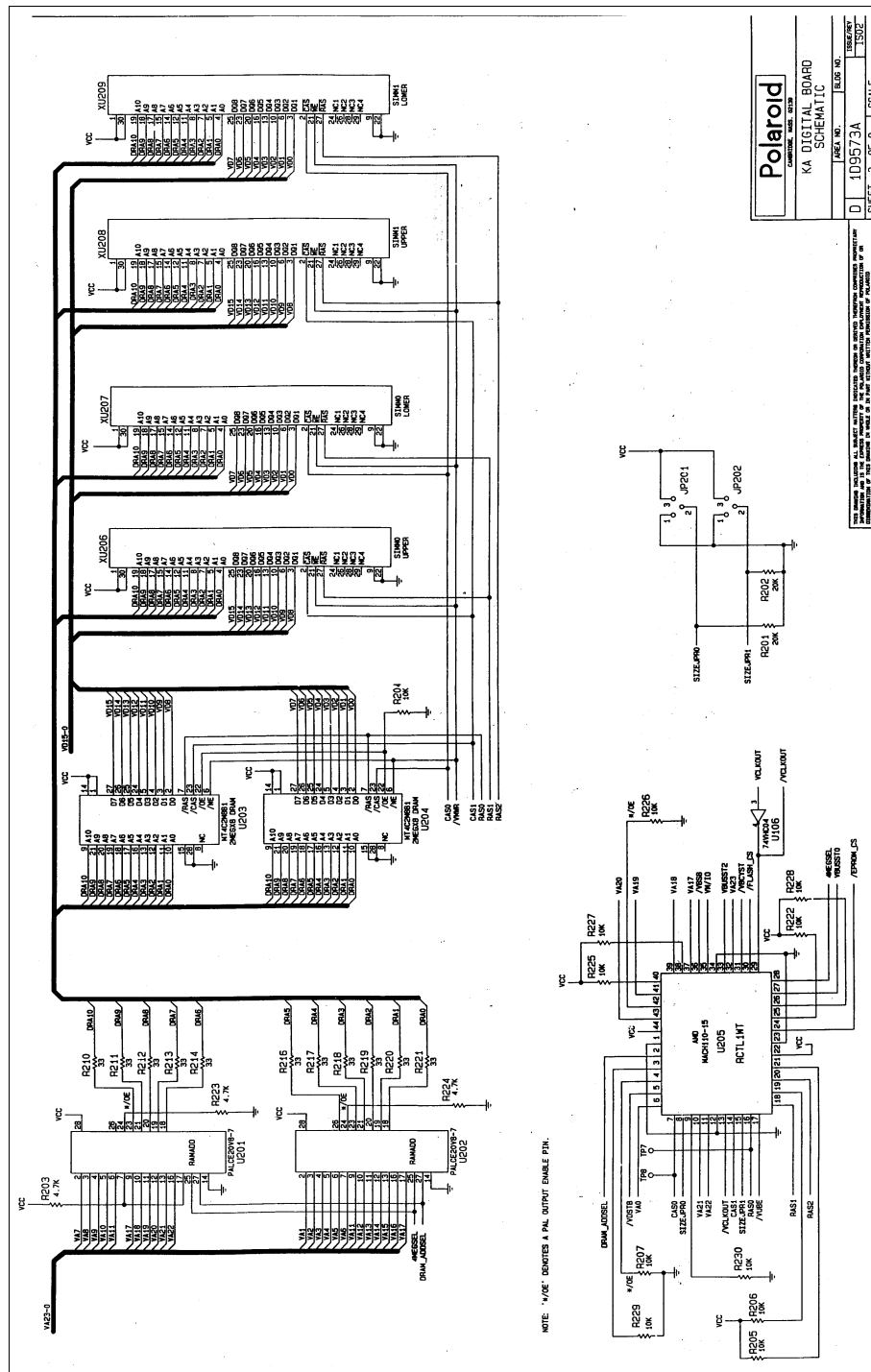


Figure 7-3. Digital Board schematic, Sheet 2 of 9

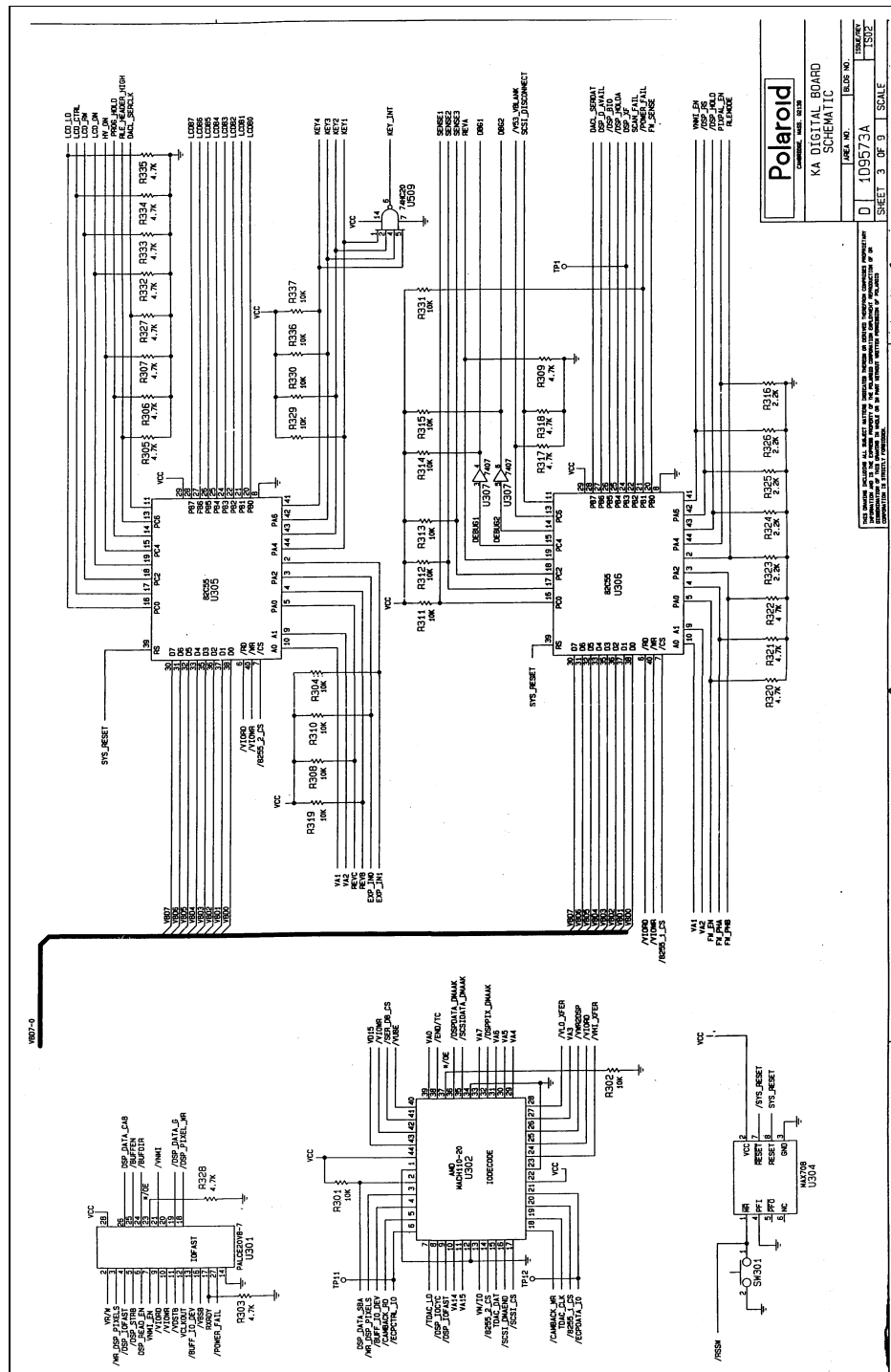


Figure 7-4. Digital Board schematic, Sheet 3 of 9

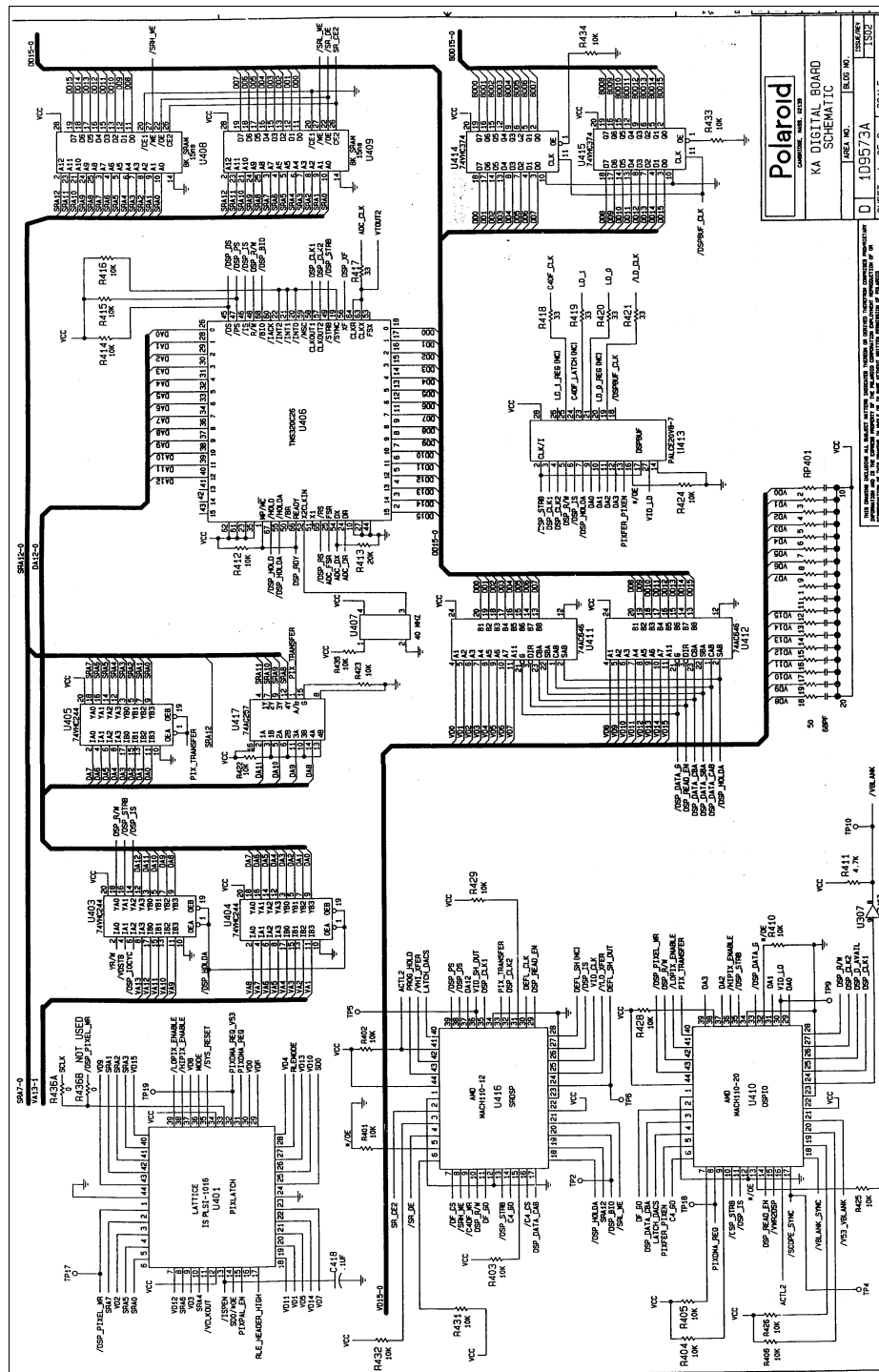


Figure 7-5. Digital Board schematic, Sheet 4 of 9

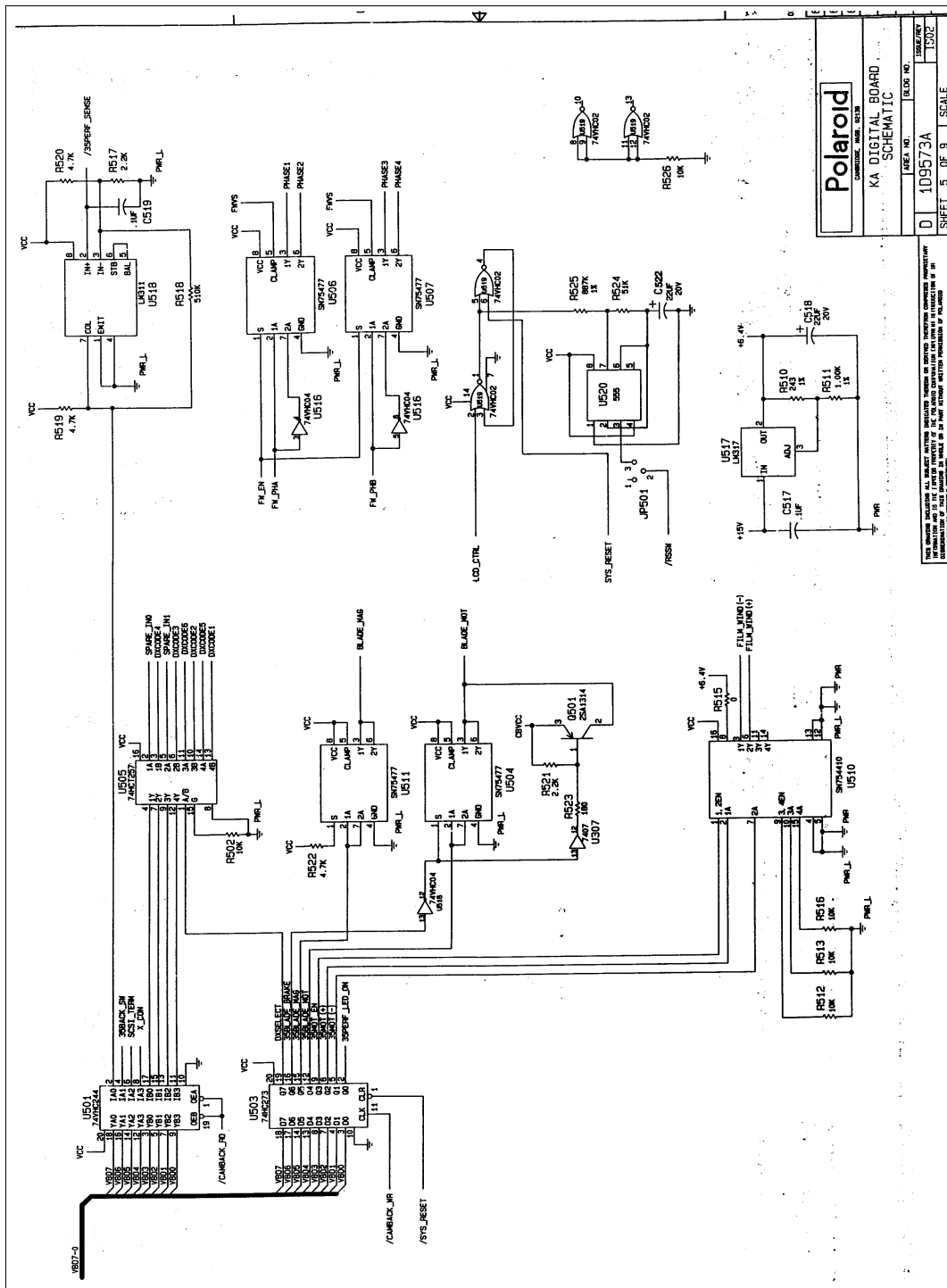
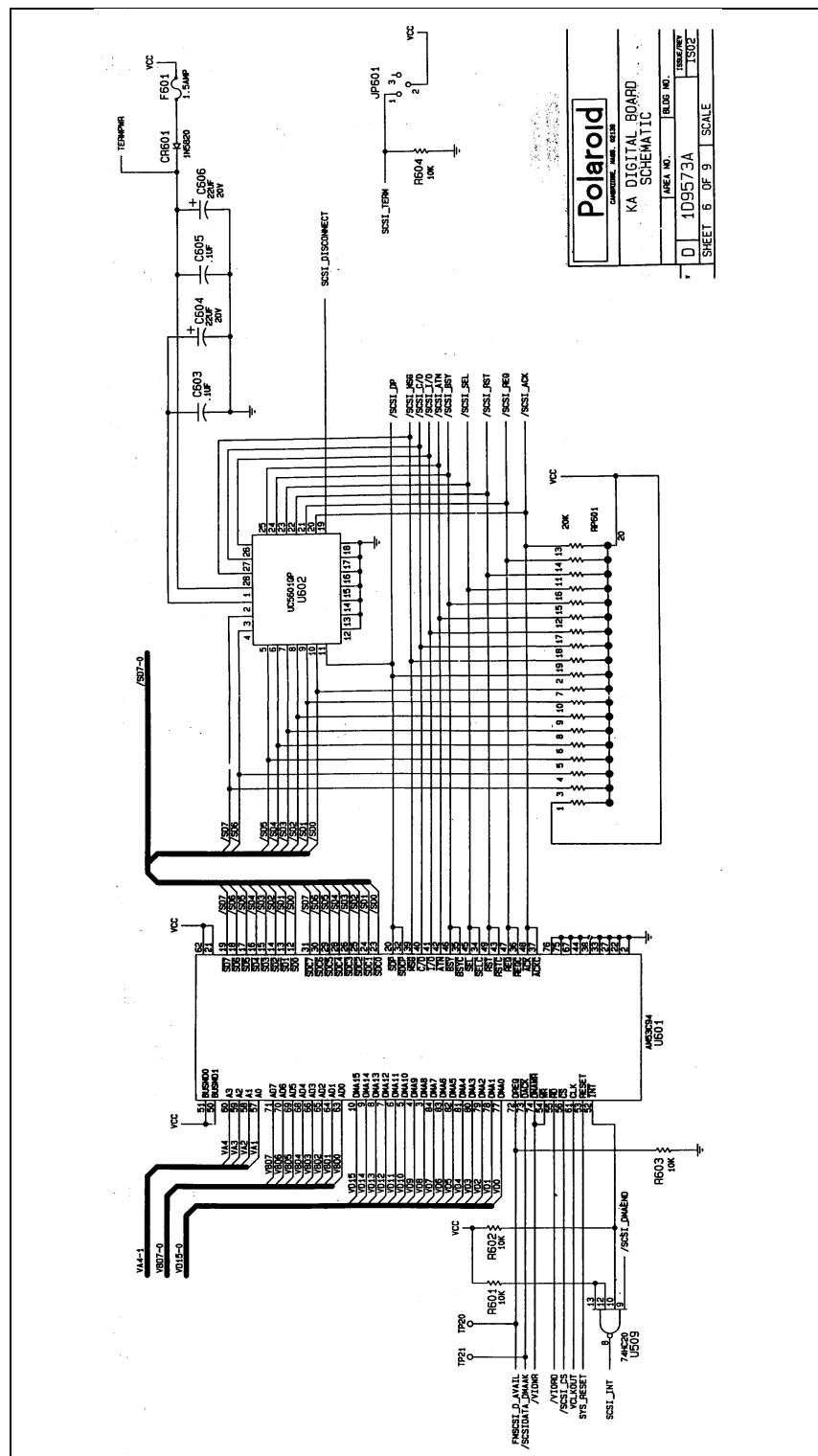


Figure 7-6. Digital Board schematic, Sheet 5 of 9



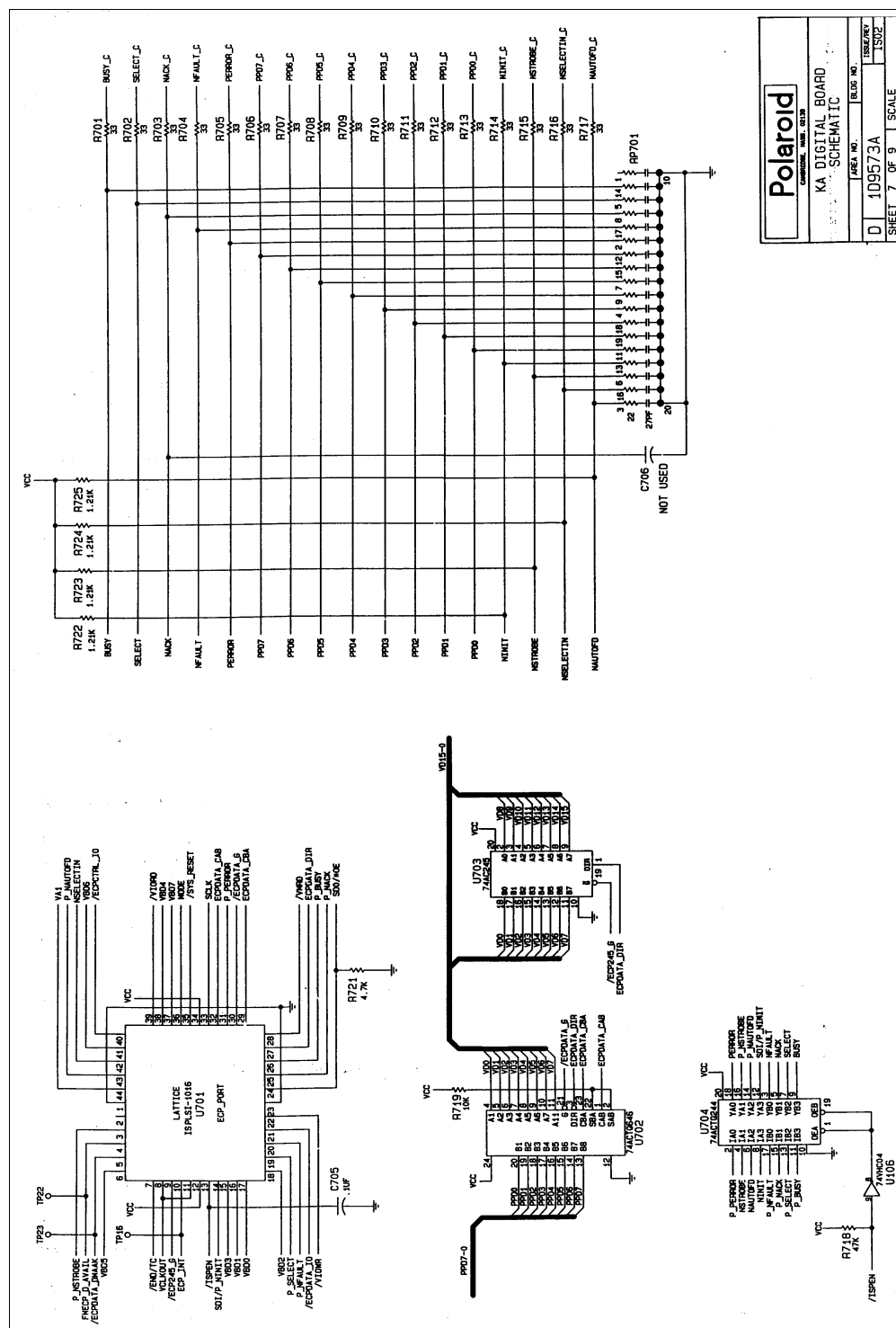
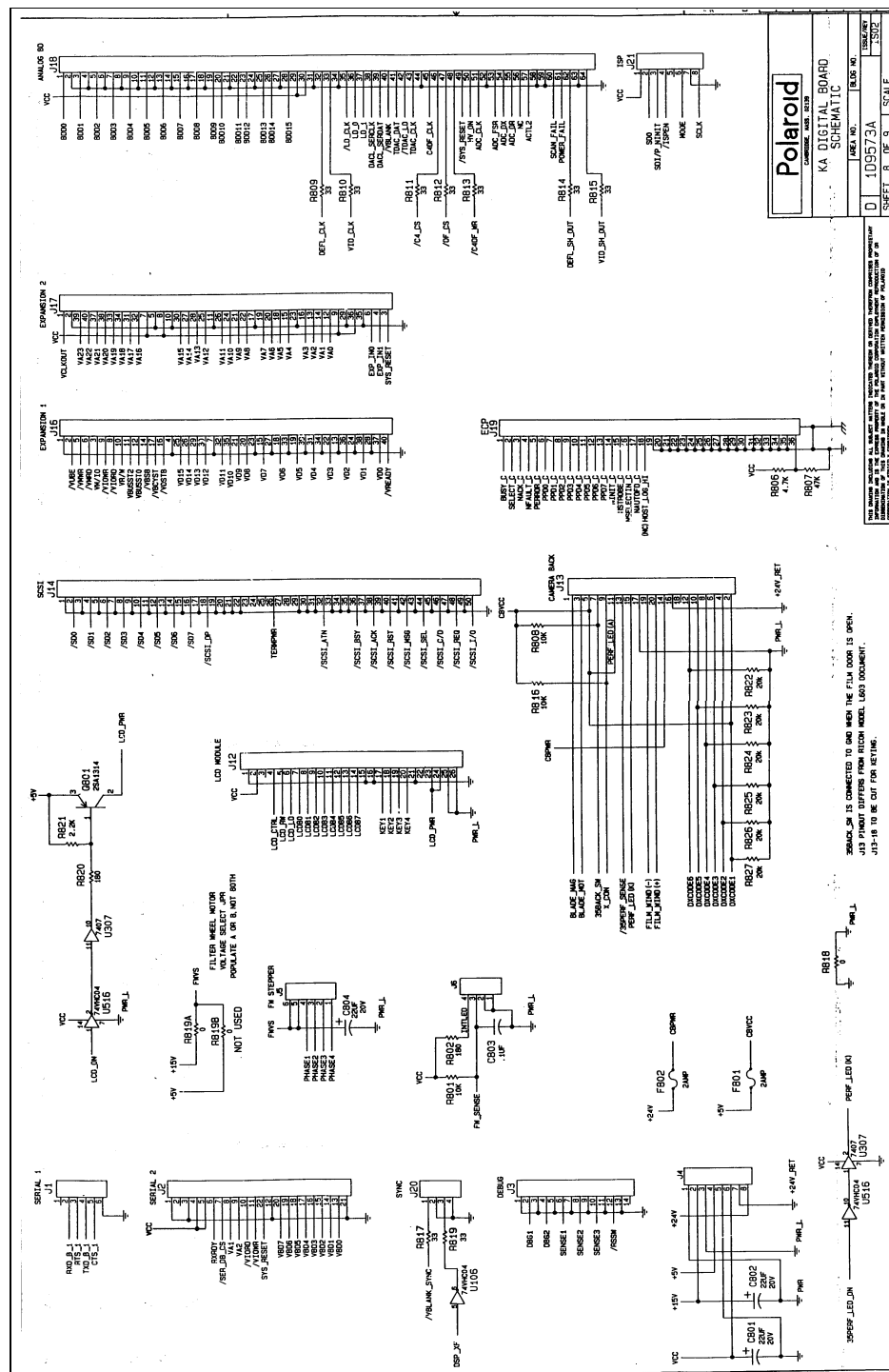


Figure 7-8. Digital Board schematic, Sheet 7 of 9



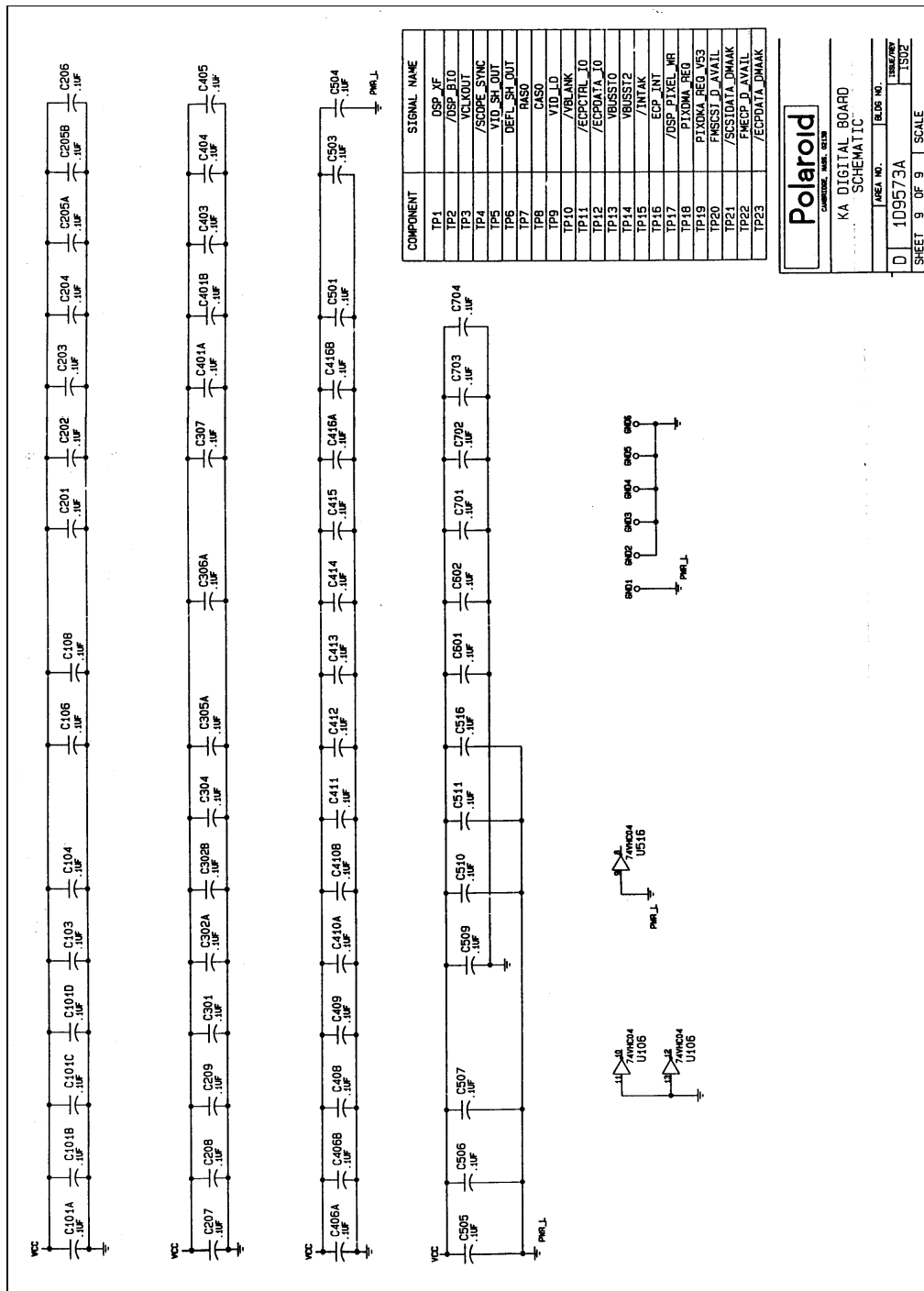
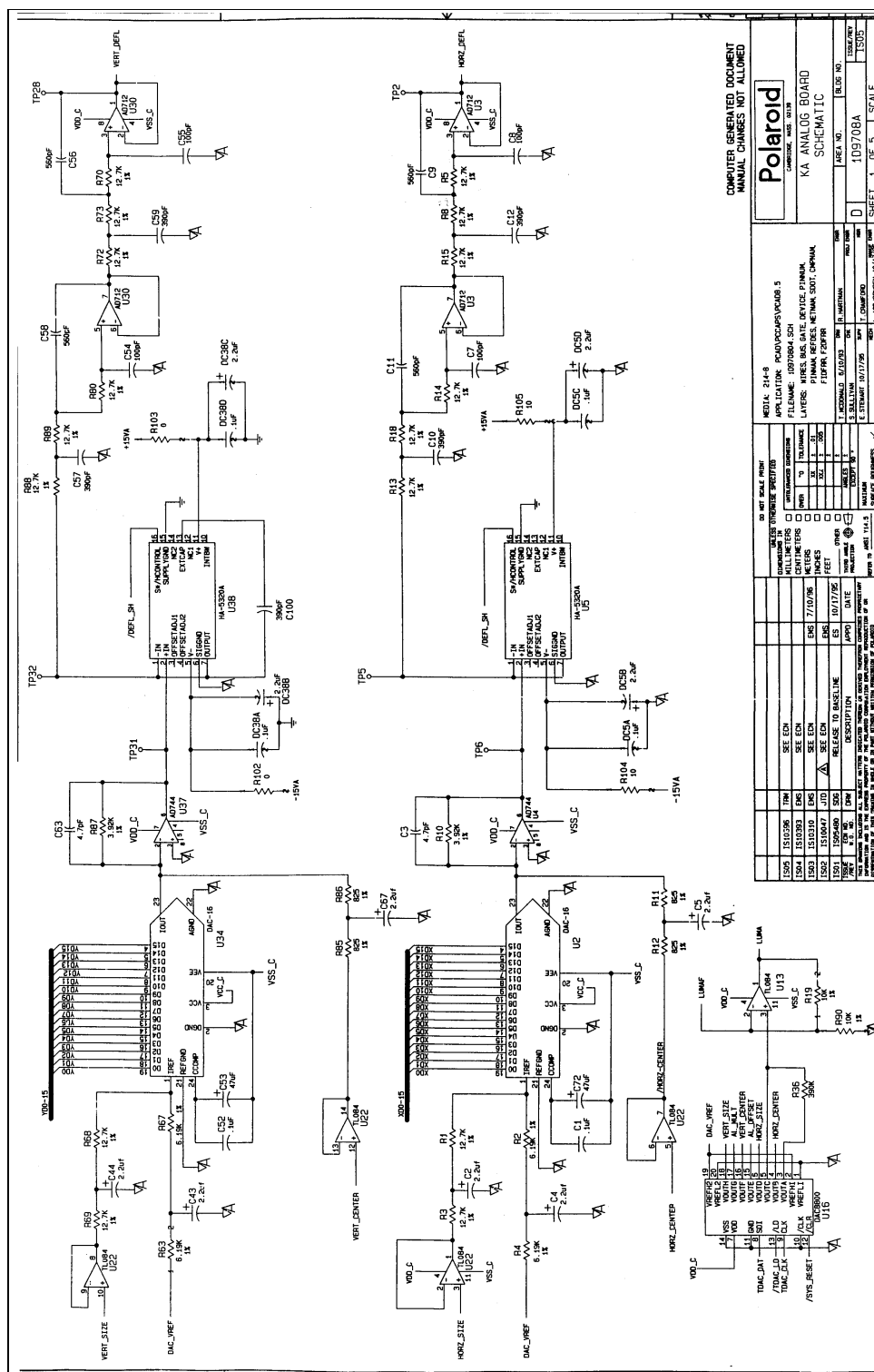


Figure 7-10. Digital Board schematic, Sheet 9 of 9



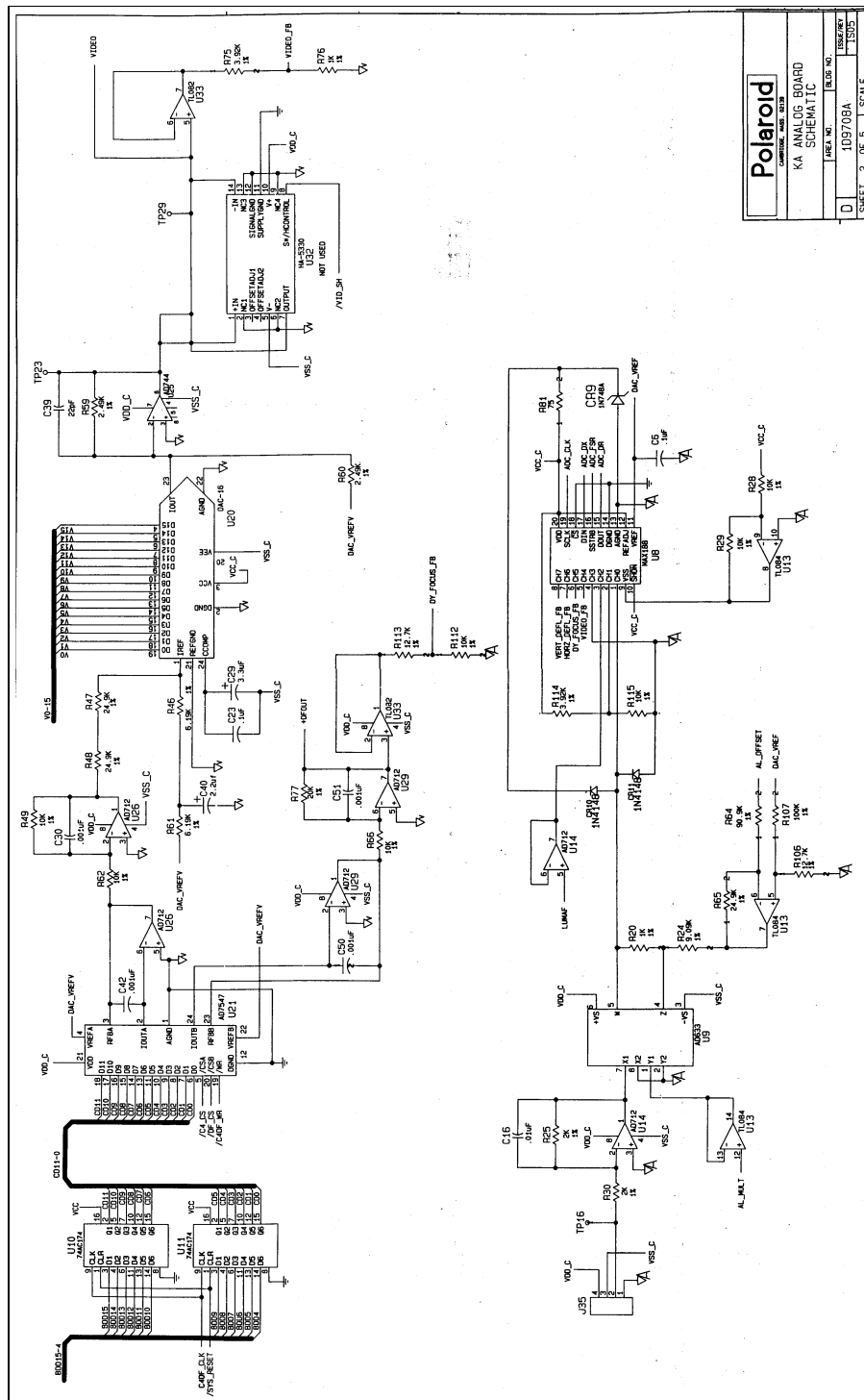


Figure 7-12. Analog Board schematic, Sheet 2 of 5

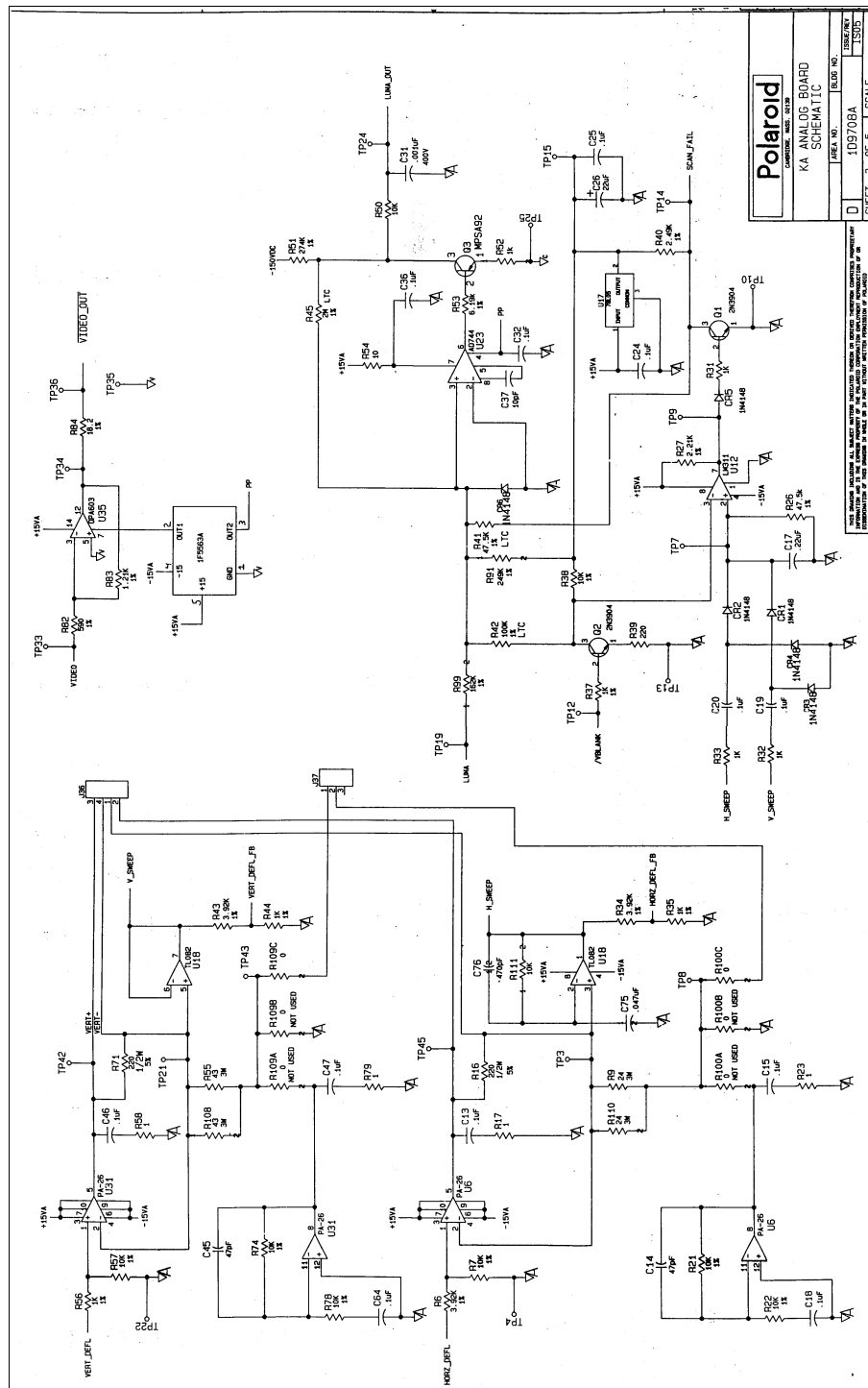


Figure 7-13. Analog Board schematic, Sheet 3 of 5

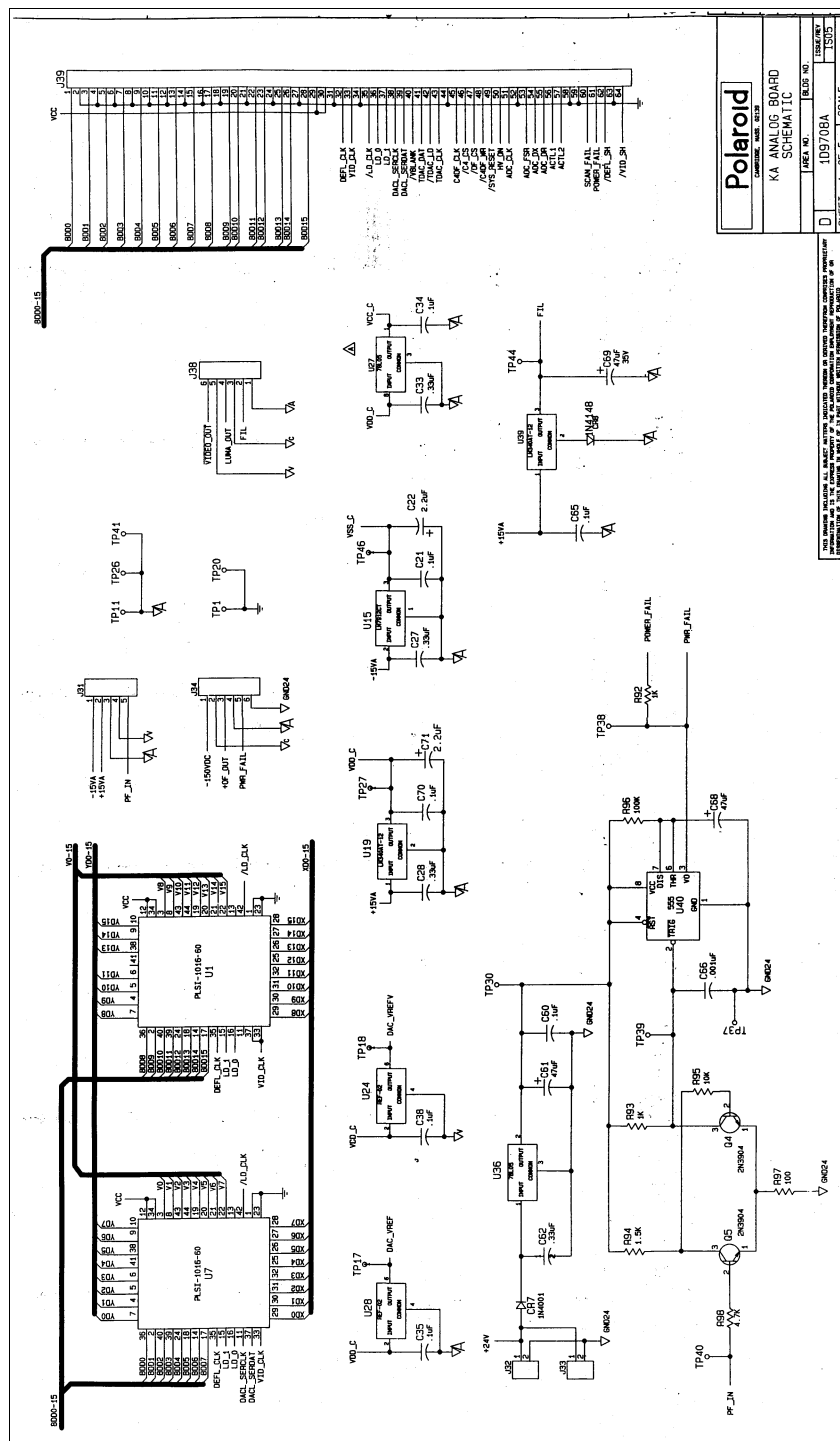
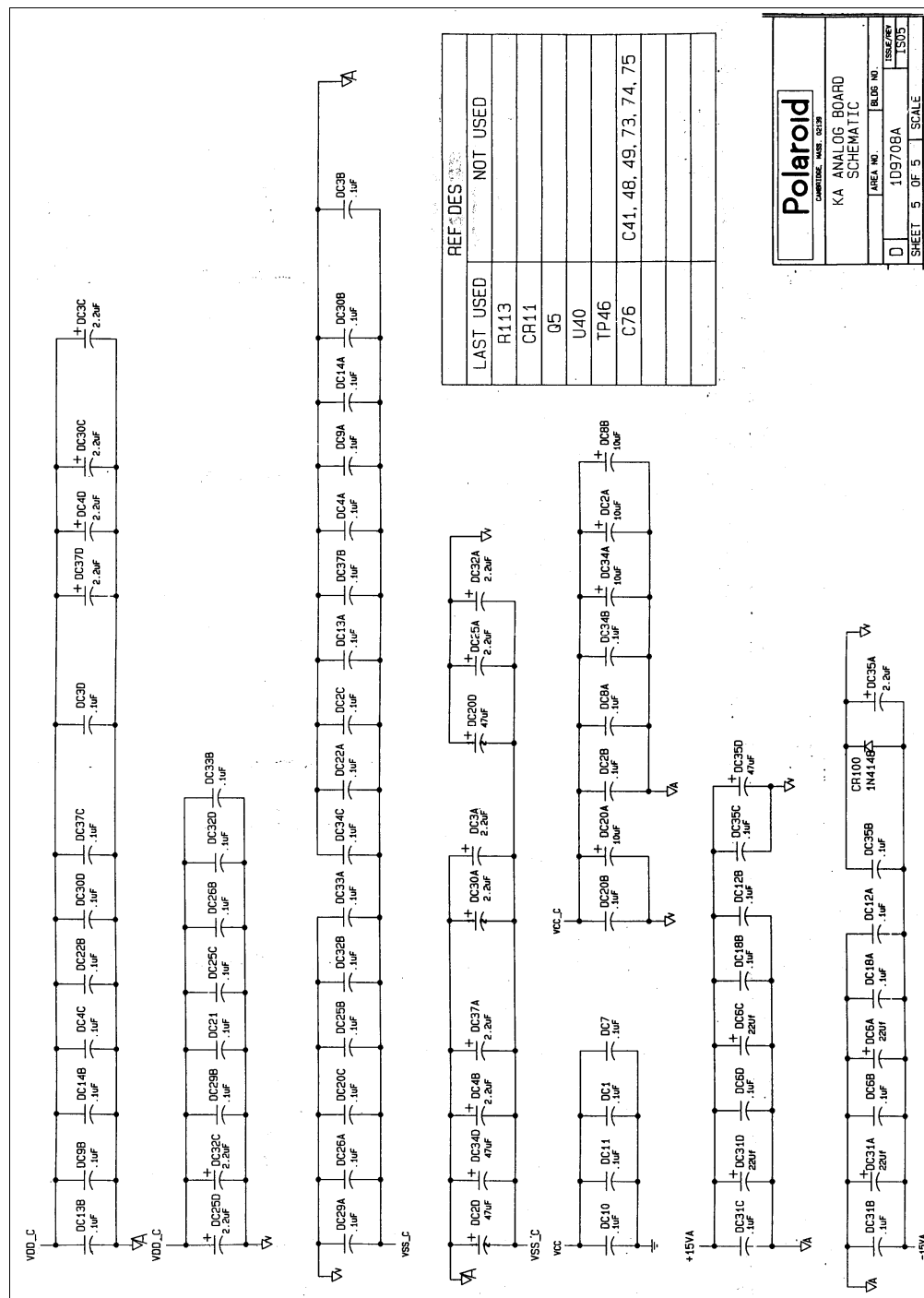


Figure 7-14. Analog Board schematic, Sheet 4 of 5



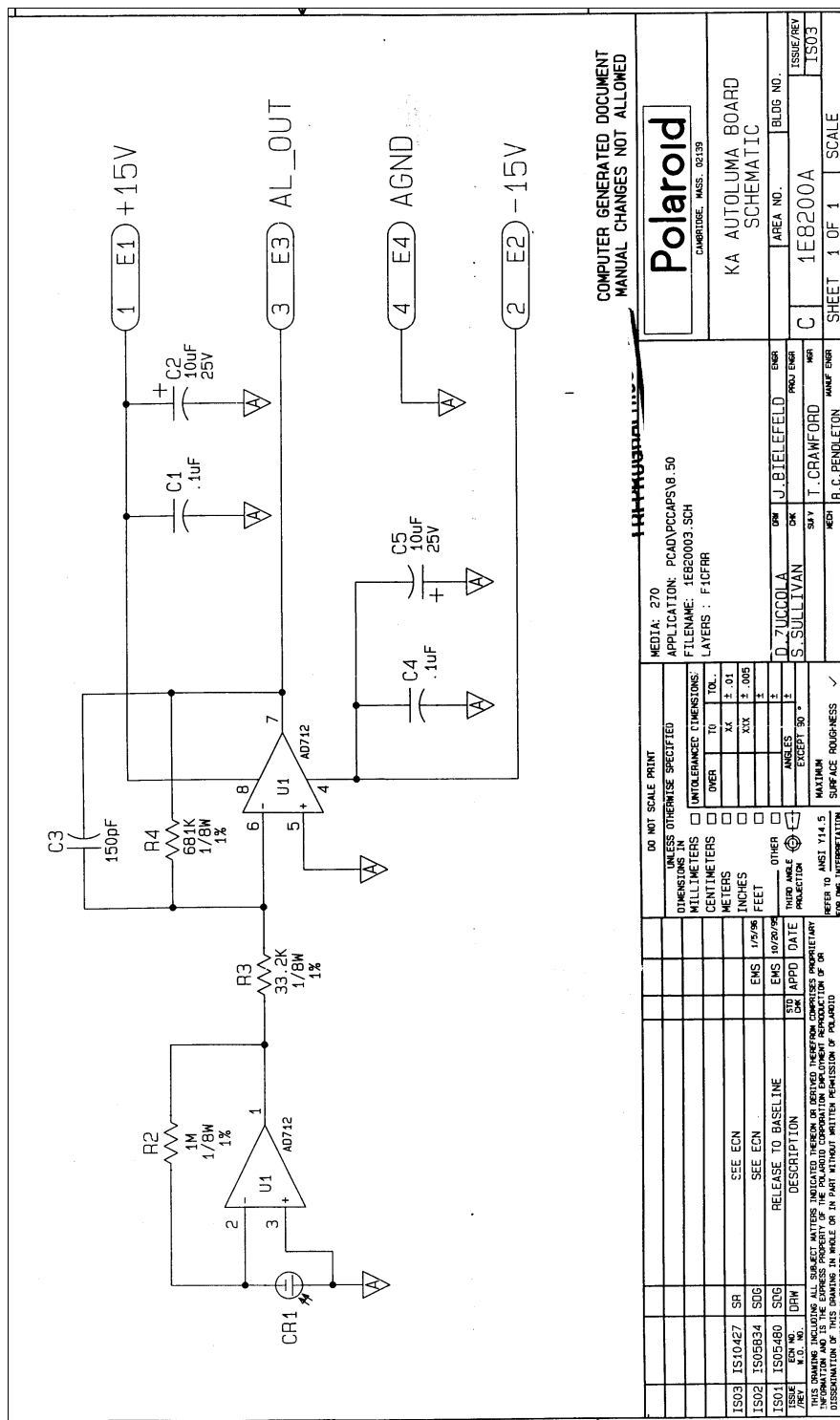


Figure 7-16. Autoluma Board schematic

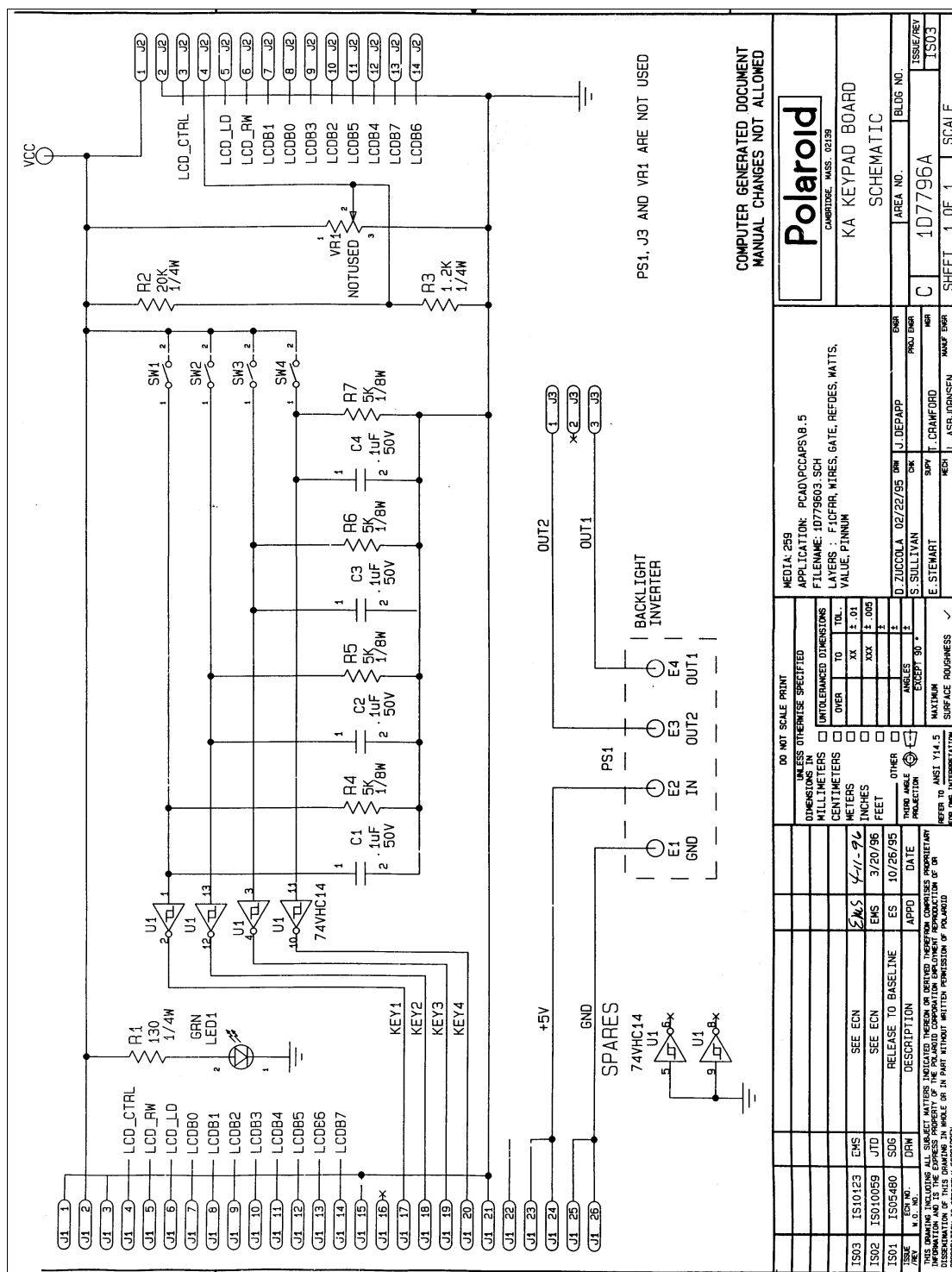


Figure 7-17. Keypad Board schematic

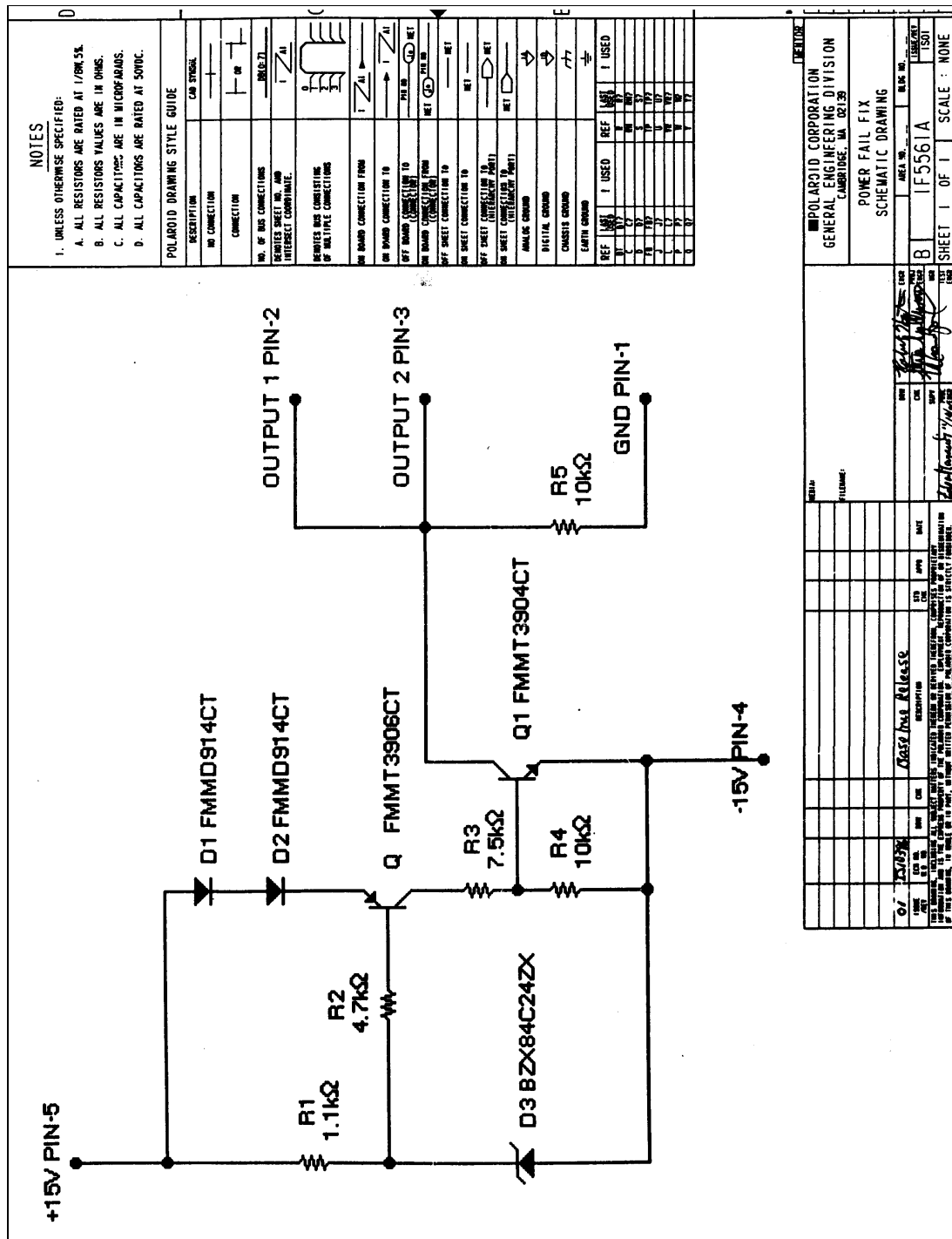


Figure 7-18. Power Fail Fix schematic

Notes

Appendix A. Film Table List

The ProPalette 8000 stores exposure and color balance data for the following film types as “film tables” in non-volatile memory:

35mm - Instant Films

Polaroid High Contrast Polachrome Slide Film
Polaroid Polapan Slide Film
Polaroid Polachrome Slide Film
Polaroid Polagraph Black and White Slide Film

35mm - Positive E6 Processed Slide Films

Polaroid HighDefinition Slide Film
Polaroid KonicaChrome Slide Film
Polaroid Presentation Chrome Slide Film
Fujichrome Velvia 50 Slide Film
Fujichrome Sensia RD 100 Slide Film
Fujichrome Sensia RDII 100 Slide Film
Fujichrome Professional Provia 100 Daylight RDPII Slide Film
Kodak Ektachrome Elite 100 Slide Film
Kodak Ektachrome Elite 200 Slide Film
Kodak Ektachrome Lumiere Professional 100 Slide Film
Kodak Dyna Elite 100 Slide Film

35mm - Negative C41 Processed Print Films

Polaroid High Definition DEF1 100 ASA 35mm Color Negative Film
Polaroid HD4 100 ASA 35mm Color Negative Film
Fuji Neopan SS 100 ASA 35mm B/W Negative Film
Fujicolor Super G Plus 100 ASA 35mm Color Negative Film
Konica 100 ASA 35mm Color Negative Film
Kodak Plus-X pan 125 ASA 35mm B/W Negative Film
Kodak Gold Plus 100 ASA 35mm Color Negative Film
Kodak Vericolor III 160 ASA 35mm Color Negative Film

4 x 5 Format Instant Film

Polaroid Polacolor Pro 100 4x5 Sheet Film
Polaroid Type 53 Black and White 4x5 Sheet Film
Polaroid Type 59 Professional Color 4x5 Sheet Film

4 x 5 Format Positive E6 Processed Films

Kodak Ektachrome 100 Plus Professional 4x5 Sheet Film EPP
Kodak Ektachrome Lumiere 100 Professional 4x5 Sheet Film LPP
Fujichrome Professional Provia 100 4x5 RDPII Sheet Film
Fujichrome Velvia 50 RVP 4x5 Sheet Film

4 x 5 Format Negative C41 Processed Films

Kodak T-Max 100 ASA B/W Negative Film
Kodak Vericolor VPS III 160 ASA 4x5 Color Negative Film

6 x 7 Format Positive E6 Processed Films

Kodak Ektachrome 100 Plus Professional 6x7 120 Film EPP
Kodak Ektachrome Lumiere 100 Professional 6x7 120 Film LPP
Fujichrome Professional Provia 100 6x7 120 Film RDPII
Fujichrome Velvia 50 6x7 120 Film RVP

6 x 7 Format Negative C41 Processed Films

Kodak T-Max 100 Black and White Negative Film
Kodak Vericolor VPS III 160 ASA Color Negative Film
Fujicolor Professional 160 NPS Color Negative Film

6 x 8 Format Positive E6 Processed Films

Polaroid Polacolor Professional Instant Pack Type 679. Set the German Lens @f11
Kodak Ektachrome 100 Plus Professional 6x8 120 Film EPP. Set the German Lens @f11
Kodak Ektachrome Lumiere 100 Professional 6x8 120 Film LPP. Set the German Lens @f11
Fujichrome Professional Provia 100 6x8 120 Film RDPII. Set the German Lens @f11
Fujichrome Velvia 50 RVP 6x8 120 Film. Set the German Lens @f11

6 x 8 Format Negative C41 Processed Films

Kodak T-Max 100 Black and White Negative Film
Kodak Vericolor VPS III 160 ASA Color Negative Film
Fujicolor Professional 160 NPS Color Negative Film

Appendix B. Abbreviations in This Manual

Many terms in this manual are abbreviated to improve readability. Abbreviated terms are usually spelled out the first time they are used and followed by their abbreviations or acronyms in parenthesis. Thereafter, the abbreviation or acronym alone is used.

The abbreviations or acronyms, both defined and undefined, used in this manual are as follows:

μsec microsecond	Hz Hertz	NOP Software delay
A/D Analog to Digital	I/O input/output	nsec nanosecond
AC Alternating Current	ID Identification	PAL Programmable Array Logic
ADC Analog to Digital Converter	KB Kilobyte (1024 bytes)	RAM Random Access Memory
CCD Charge Couple Device	kg kilogram	RLE Run Length Encoded
cm centimeter	lb pound	ROM Read Only Memory
Cos⁴ Cosine ⁴	LCD Liquid Crystal Display	SCSI Small Computer System Interface
CPU Central Processing Unit	LED Light Emitting Diode	SIMM Single Inline Memory Module
CRT Cathode Ray Tube	LSB Least Significant Byte/Bit	SRAM Static RAM
D/A Digital to Analog	LUT Look Up Table	TI Texas Instrument
DAC D/A Converter	MB Megabyte (1024 KB)	Vac Volts-AC
DC Direct Current	MIPS Mega Instructions per Second	Vcc Digital supply voltage
DRAM Dynamic RAM	mm millimeter	Vdc Volts-DC
DSP Digital Signal Processor	Msample Mega samples	
DyFocus Dynamic Focus	MSB Most Significant Byte/Bit	
EPROM Erasable Programmable ROM	msec millisecond	
	mux Multiplexer	